NCR

NCR 7193 Thermal Receipt Printer

Owner's Guide

Contents

Chapter 1: About the 7193 Printer

The 7193 thermal receipt printer is fast (at 1020 lines per minute), quiet, and very reliable. With thermal printing technology, there is no ribbon cassette to change, and paper loading is extremely simple. The printer is small enough to fit almost anywhere and is easy to use with the receipt exiting from the top. There is no journal as it is kept electronically by the host computer.

Operator Panel

Cover

Receipt Paper

Tear Off Blade/Knife
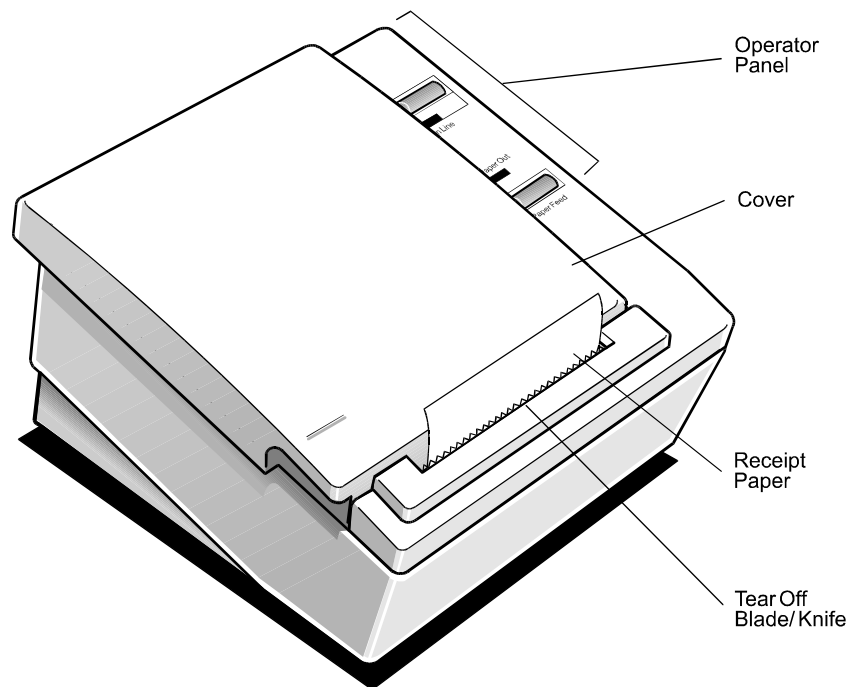
Models

There are several models of the 7193 depending on the communication interface and the combination of options selected.

Communication Interfaces

- RS-232C
- Parallel

See "Chapter 5: Communication" for more information about the communication interfaces.

Features

All models come with the following features:

- Drop-in paper loading with no spindle or complicated paper path
- Host-selectable 44 or 56 columns of print on 80 mm wide "fax grade" thermal paper
- 1020 lines per minute
- Two resident selectable character sets:
  - PC Code Page 437 (US)
  - PC Code Page 850 (Multilingual)
- 16K RAM for downloadable character sets and bit-mapped graphics
- 4K buffer
- History EEROM
- Audible tone (controlled by application)
- Paper exhaust
- Resident bar codes
  - Code 39
  - Code 128
  - UPC-A
  - UPC-E
  - JAN8 (EAN)
  - JAN13 (EAN)
  - Interleaved 2 of 5
  - Codabar

Options

The following options are available:

- Paper cutter
- Cash drawer drivers: will open a separately purchased cash drawer under software command
- Wall-mount kit for hanging the printer on a wall. See "Setting Up the Printer" in chapter 2.
- Remote power supply (with or without wall-mount kit). See "Setting Up the Printer" in chapter 2.
- Communication cable

Thermal Printhead

The 7193 uses a thermal printhead for printing receipts, and it is extremely fast and quiet. Since it uses heat to print directly on paper, there is no cassette or ribbon to change, eliminating soiled fingers and paper dust.

The printhead is designed for a very long life, but it may be replaced if needed. Only a trained service technician may replace the printhead. See "Chapter 3: Solving Problems" to determine if the printhead needs to be replaced. If the printhead needs to be replaced, contact your Axiohm-authorized service organization. See "Cleaning the Printer" later in this chapter for cleaning instructions for the printhead.

Ordering Thermal Paper

The 7193 requires qualified thermal thermal paper with the following dimensions:

Diameter	Length	Width
83 mm max. (3.27 in.)	83 meters (273 ft.)	80 mm ± .2 mm (3.15 ± .02 in.)

The paper must not be attached at the core. Use paper with a colored stripe at the end to indicate that the paper is running low.

To order thermal receipt paper, contact your sales representative or order from NCR at the following address or toll free number:

NCR
Media Products Division
9995 Washington Church Road
Miamisburg, OH 45342
Voice: 1(800)543-8130 (toll free), or local listing of Media Products sales office

Ordering Other Supplies

Contact your sales representative to order the supplies listed in the table.

Item	Type	Number
Power supply with attached cable to printer and U.S. power supply cord		7193-K330
Power supply, attached cable		7193-K301
Power supply cord (to outlet)	United States	7193-K320
	International (no plug)	7193-K321
	United Kingdom	7193-K322
	S.E.V.	7193-K323
	Australia	7193-K324
	International (with plug)	7193-K326
Communication cables		
RS-232C 25-pin (host) to 9-pin	(3 meters—9.8 ft.)	1420-C001-0030
RS-232C 9-pin to 9-pin	(3 meters—9.8 ft.)	1416-C057-0030
Parallel 25-pin to 25-pin	(3 meters—9.8 ft.)	1420-C003-0030
Printer wall-mount kit		7193-K260
Cash Drawers		7052-K657

Cleaning the Printer

There is no customer maintenance required for the 7193.

Cleaning the Cabinet

Clean the cabinet as needed to remove dust and finger marks. Use any household cleaner made for plastics, but test it first on a small unseen area. If the receipt paper bucket is dirty, wipe it with a clean, damp cloth. The cabinet materials and finish are durable and are resistant to the following items:

- Cleaning solutions
- Lubricants
- Fuels
- Cooking oils
- Ultraviolet light

Cleaning the Thermal Printhead

If the printhead appears dirty, clean it with cotton swabs and rubbing alcohol.

Caution: Do not spray the thermal printhead with household cleaner as this may damage it and the electronics.

If spotty or light printing problems persist after cleaning the thermal printhead, contact your NCR authorized service representative.

Note: The thermal printhead does not normally require cleaning if the recommended paper grades are used. If non-recommended paper has been used for an extended period of time, cleaning the printhead with the alcohol pen will not be of much benefit. See "Ordering Thermal Paper" earlier in this chapter for recommended paper.

Chapter 2: Setting Up the Printer

What Is in the Box?

The following items are packed in the shipping box (printers shipped in bulk may not include all of these items):

- Printer enclosed in a plastic bag and foam pack
    - Thermal paper roll (inside printer)
    - Test printout protecting the printhead (inside printer)
- Power supply with attached cable to printer (only if ordered with the printer)
    - Power cord—from power supply to outlet (only if ordered with the printer)
    - Wall-mount holder for the power supply with screws and wall anchors (only if ordered with the power supply)
    - Tie-wrap for cable
- Installation report card (please complete this form and return to NCR)
- *7193 Thermal Receipt Printer: Setup and User's Guide*

These items may be ordered as options from NCR and will be shipped separately:

- Wall-mount kit for the printer
- Communication cable (from host computer to printer)
- Cash drawer with cables (may be ordered from other equipment suppliers: see "Ordering Other Supplies" in chapter 1)

Removing the Printer

1. Remove the printer from the foam pack and open the receipt cover by pulling up on the front left corner.

2. Remove the paper roll and the test printout from inside the receipt bucket.

3. Save all packing materials for future storing, moving, or shipping the printer.

4. Complete the Installation report card and send it to NCR.

Repacking the Printer

1. Protect the printhead by placing a piece of receipt paper between the receipt cover and the printhead.

2. Place the printer in the plastic bag and foam pack.

3. Place the packed printer in the box and secure the box with packing tape.

4. If you are sending the printer to NCR for repair, call your NCR-authorized service representative for instructions on where to send the printer.

   Be prepared to answer questions concerning shipping and billing.

Choosing a Location

The 7193 is compact and requires little counter space. It may even be mounted on a wall if space is at a premium. See "Mounting the Printer on a Wall" later in this chapter. The power supply may also be mounted on a wall or under a table. See "Mounting the Power Supply on a Wall" later in this chapter. Be sure to plan for the length of the communication and power cables when choosing a location.

Make sure there is enough room to open the receipt cover and change the paper. The following illustration shows the actual dimensions of the printer, but leave several inches around the printer for connecting and accessing the cables.

119 mm
(4.69 in.)

165 mm
(6.50 in.)

225 mm
(8.85 in.)

187 mm
(7.35 in.)
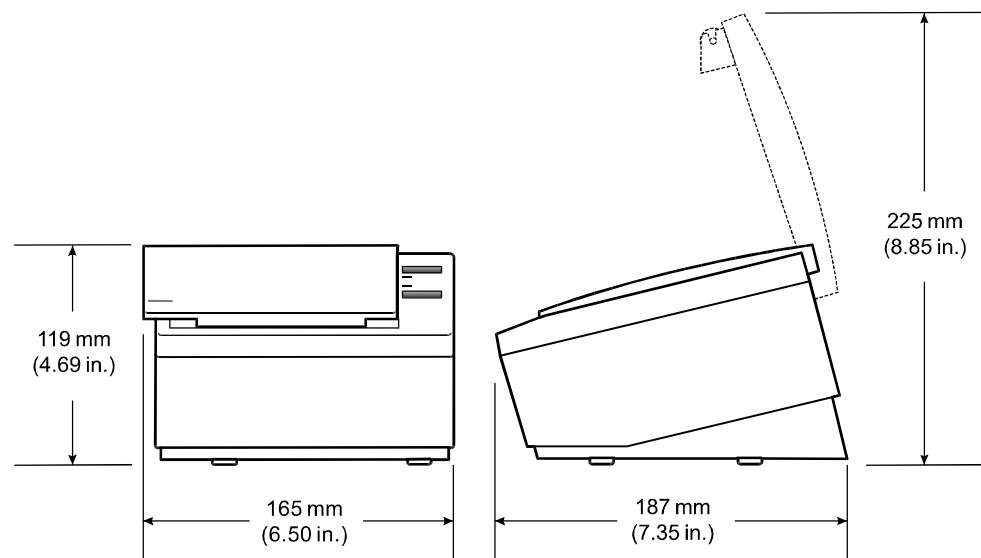
Setting Switches

A group of switches, called DIP switches, located on the bottom of the 7193, is used for the following purposes:

- To set variables for several printer functions (see the sections for the various printer functions in "Level 1 Diagnostics" in chapter 4)

- To set communication parameters for the RS-232C interface or the Parallel interface (see "RS-232C Switch Settings" or "Parallel Switch Settings" in chapter 5)

- To perform diagnostic tests (see the sections for the various diagnostic tests in "Level 1 Diagnostics" in chapter 4)

- To set the data buffer for the Parallel communication interface (see "Parallel Switch Settings" in chapter 5)

Caution: The DIP switches are set at the factory to predetermined settings and should generally not be changed. If you must change the settings do so carefully to avoid changing other functions.

Before changing any of the switches, first run the print test to print out the current switch settings on the receipt. See "Testing the Printer" later in this chapter for instructions on running the print test and for a sample printout.

Note: Switch #1 is used to toggle between communication with the host computer and the setup mode (used for the printer functions and level 1 diagnostic tests):

- Switch #1 OFF: printer is on-line, able to communicate with the host computer
- Switch #1 ON: printer is in Level 1 Diagnostics (setup mode)

If you want the printer to communicate with the host computer, be sure switch 1 is OFF. Use a paper clip or other pointed object to set the switch.

For additional information on the setup mode (Level 1 Diagnostics), see chapter 4.

Note: Some 7193 models may appear slightly different than what is shown in the illustration. The procedures are the same for all models unless otherwise noted.

Bottom of Printer

DIP Switches

Switch 1 is shown in the ON position
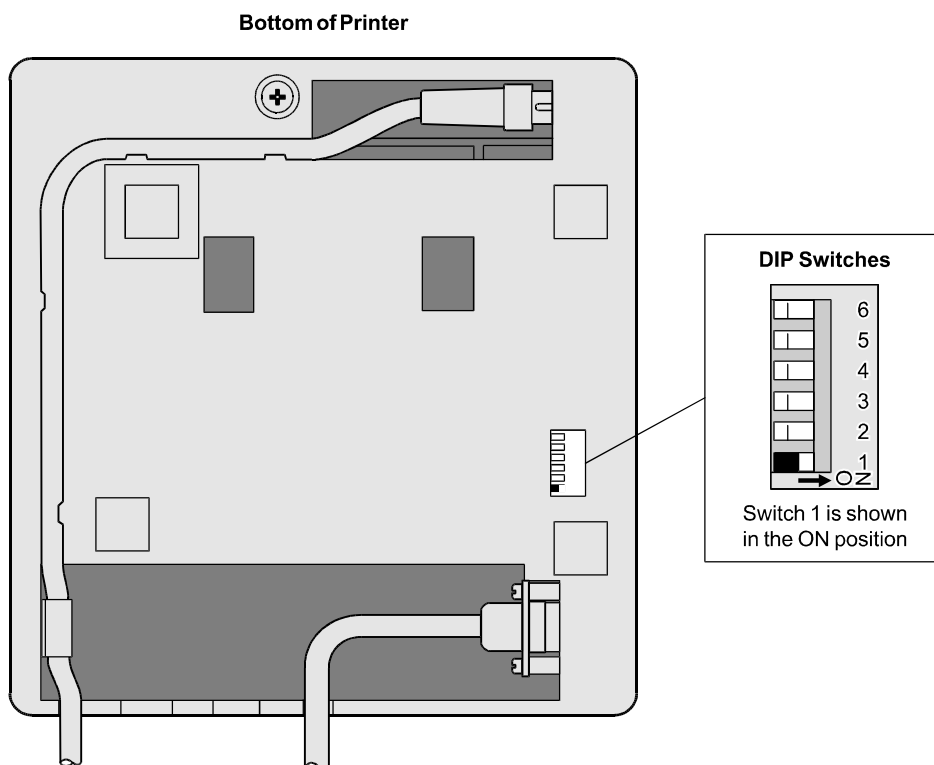
Connecting Cash Drawer Cables

The cash drawer option allows up to two cash drawers to be connected to the printer in a system with a host computer that has no connectors for the cash drawer cables. The cash drawer cables usually come with the cash drawer.

The cash drawers are operated by software command from the host computer through the printer. For additional information on the printer commands used by the host computer to activate the cash drawers, see "Chapter 6: Commands."

1. Plug the cash drawer cables into the connectors on the printer.

   The connectors are standard phone connectors.

2. If only one cash drawer is used, plug the cable into the connector labeled 1.

Note: Some 7193 models may appear slightly different than what is shown in the illustration. The procedures are the same for all models unless otherwise noted.

1   2

Communication   Cash Drawer   Power Supply
Cable Slot   Connectors   Cable Slot

Back View of Printer
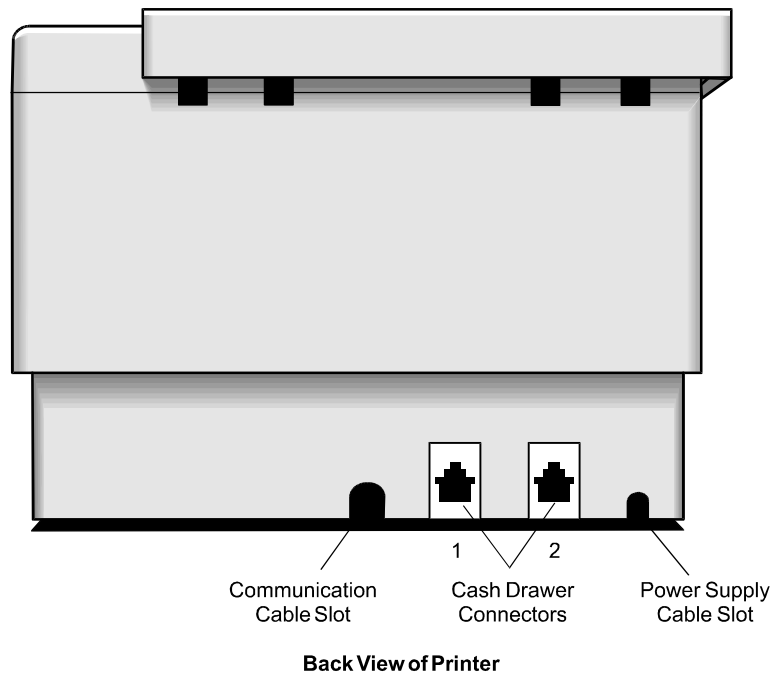
Connecting Communication and Power Cables

The printer uses separate cables for communicating with the host computer and receiving power from the power supply.

Caution: Be sure that all power is disconnected before connecting the cables.

1. Turn off the host computer or unplug the power supply if it is plugged in.

2. Plug the power supply cable into the printer first, then plug the power cord into the power supply, then into an outlet.

3. Connect the communication cable to the printer, then to the host computer.

RS-232C Models

Bottom of Printer

Power Supply Connector

Power Supply Cable Route

9-Pin Communication Connector

Cable Clamp

Power Supply Cable

Communication Cable

Parallel Models

Bottom of Printer

Power
Supply
Connector

Power Supply
Cable Route

Cable
Clamp

2   1

Power   Cash Drawer
Supply Cable   Drivers

25-Pin
Communication
Connector

25-pin
Communication
Cable

Turning On the Printer

On Line
Button

On Line   On Line
Light

On Line Button
with Recessed
Plunger

On Line   On Line
Light

Paper Out   Paper Out

Paper Out   Paper Out
Light   Light

Paper Feed   Paper Feed

Standard   **Alternate Version**
Operator Panel   **Operator Panel**
(Remote Printer)   **(Remote Printer)**

Note: The operator panel may differ from the standard version (left) depending on the model. On models matching the alternate version (right), use a paper clip or pointed object to press the plunger to put the printer on- or off-line.

1. Press the On Line button (or plunger) to put the printer on-line.

    The printer goes through a self-test routine to ensure everything is working, then "beeps." The On Line light (green) comes on indicating the printer is on-line. If the On Line light does not come on, or either the On Line light or Paper Out light flashes, see the Owner's Guide for more information.

2. Press the On Line button (or plunger) again to put the printer off-line.

When the printer has completed its "startup" cycle it is ready to receive data. If the Paper Out light flashes, see "Chapter 3: Solving Problems."

Note: The printer receives power when the power supply is on even if the printer is off-line. To completely remove power, press the On Line button (or plunger) to put the printer off-line (On Line light is off), then unplug the power supply from the outlet.

Loading and Changing Paper

The 7193 features extremely simple paper loading. See the next two illustrations.

If you are loading paper for the first time and have already taken the roll out, go to "Putting In the Paper Roll" later in this chapter. If you have not taken the roll out, continue with the following instructions. Although the illustrations show a used roll being removed, the instructions still apply to loading paper for the first time.

When to Change the Paper

Change the paper when either of the following two conditions occurs:

- Paper low stripe appears on the receipt paper

  Change the paper as soon as possible to avoid running out of paper part way through a transaction.

- Paper Out light (red) turns on

  Change the paper immediately or data may be lost.

Caution: Do not operate the printer or host computer if the printer runs out of paper. The printer will not operate without paper, but it may continue to accept data from the host computer. Because the printer cannot print any transactions, the data may be lost.

Removing the Paper Roll

1 Open the cover.
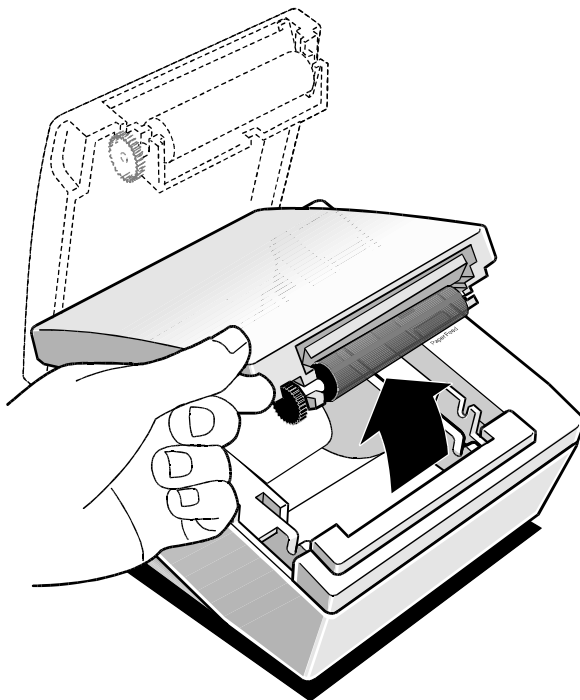
2 Remove the roll to be replaced.
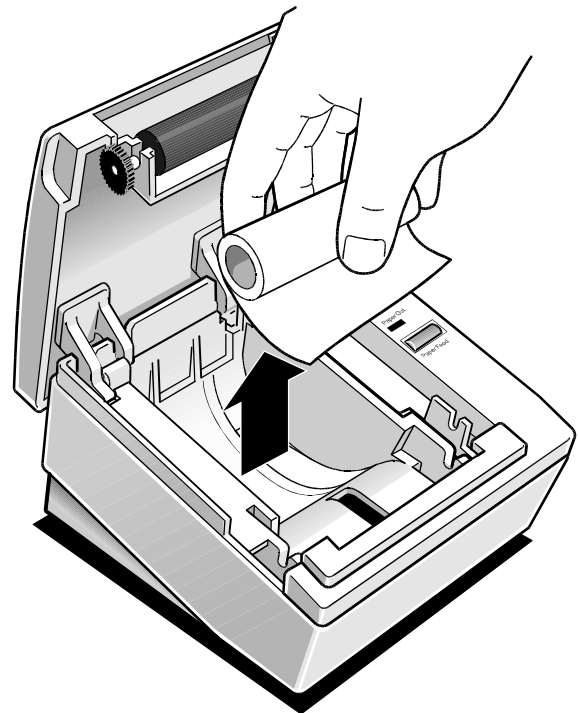
Putting In the Paper Roll

Before putting in a new roll, tear off the end of the roll so that the edge is loose.

1 Place the roll into the bin with a few inches of paper extending over the cabinet front (or top, if printer is vertically mounted).

Warning: Be sure the paper unrolls from the bottom of the roll. Otherwise the paper will jam.
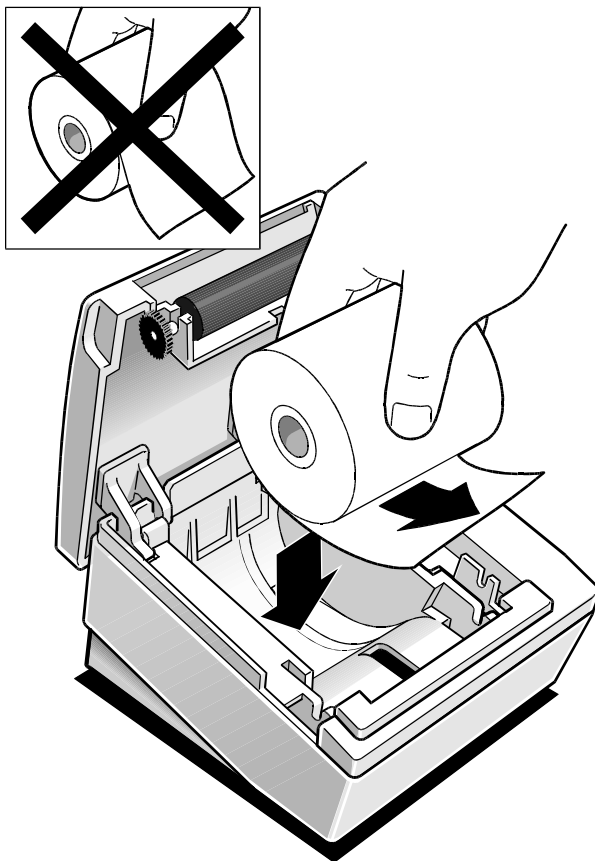
2 Close the cover.
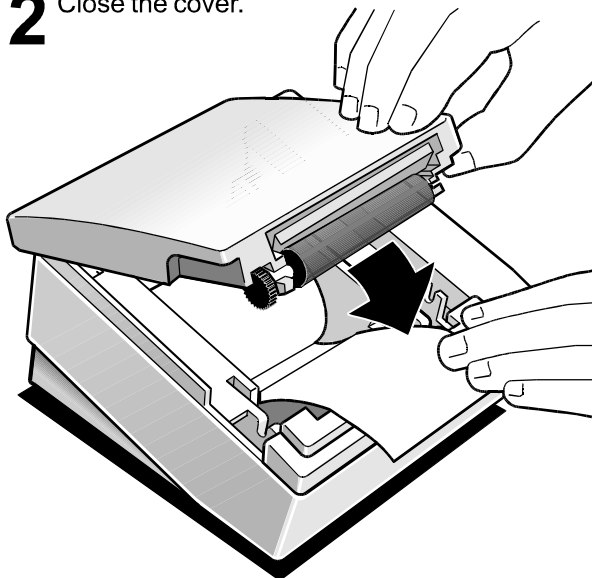
3 Remove the excess paper by tearing it against the tear off blade.

Advancing Paper
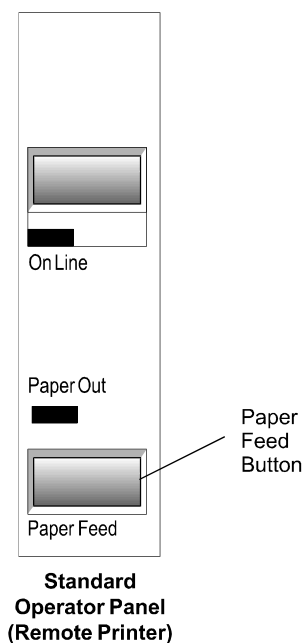
On Line

Paper Out

Paper
Feed
Button

Paper Feed

**Standard
Operator Panel
(Remote Printer)**

Note: Some 7193 models may appear slightly different than what is shown in the illustration. The procedures are the same for all models unless otherwise noted.
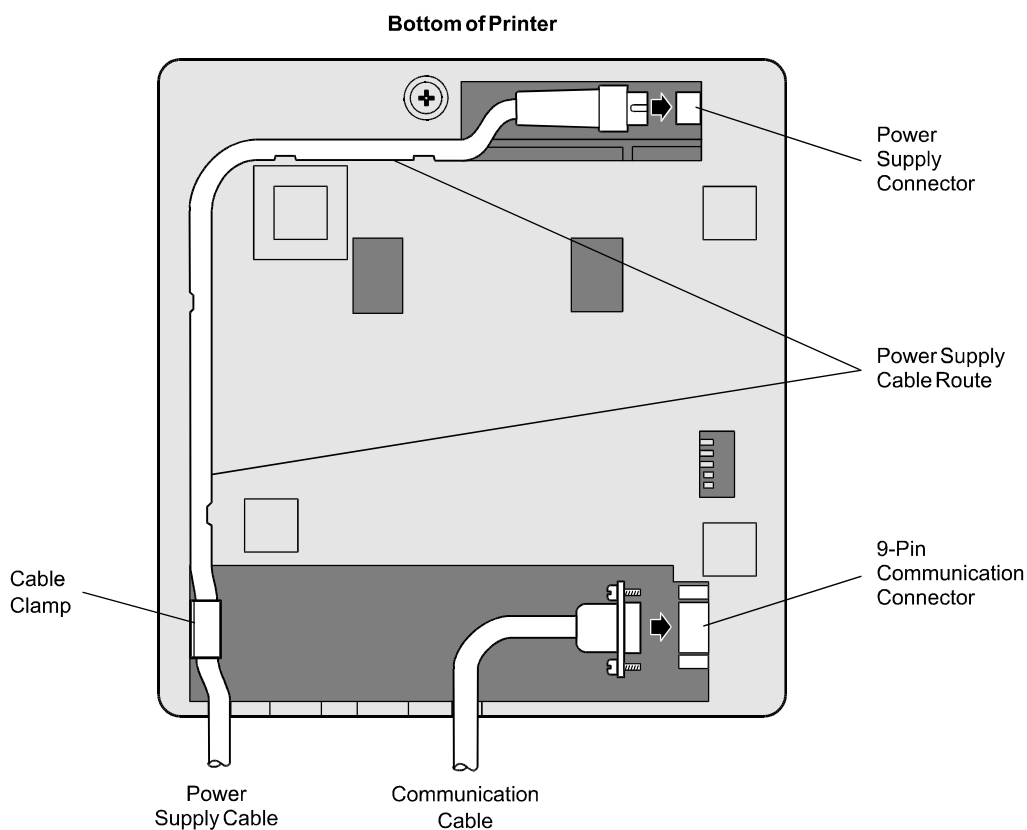
1. To advance the receipt paper, press the Paper Feed button on the operator panel.

    The cover must be closed.

2. Tear off the excess paper against the tear off blade.

Clearing Paper Jams

Paper jams are rare, and if they do occur are simple to clear.

1. Open the cover.

2. Pull the paper straight.

3. Close the cover.

4. Tear off the excess paper.

Testing the Printer

Run this test to check the printer. The test prints the settings for several functions, prints all variations of the character sets, and partially cuts the paper between each variation. See "Level 1 Diagnostics" in chapter 4 for a description of the functions.

A sample printout of RS-232C printers is shown on the facing page. The printouts for other models are similar. The test ends with a partial cut, then begins again. Several feet of paper can be used to print one pass of the test.

Additional diagnostic tests may be performed by a trained service representative. For more information, see "Chapter 4: Diagnostics."

Note: The operator panel may differ from the standard version (shown on top in the illustration on the facing page) depending on the model. On models matching the alternate version (shown on bottom in the illustration), use a paper clip or pointed object to press the plunger to put the printer on- or off-line.

1. Press the On Line Button (or plunger) on the operator panel to put the printer off-line.

    The On Line light turns off indicating the printer is off-line.

2. Press and hold the Paper Feed button while pressing the On Line Button (or plunger).

3. Let go of the Paper Feed button once the printing begins.

    The printer begins printing the data and character sets until you stop the test. This can be given to a service representative if it appears there is a problem.

4. To stop the test, press the Paper Feed button.

On Line
Button

On Line

Paper Out

Paper
Feed
Button

Paper Feed

**Standard
Operator Panel
(Remote Printer)**

On Line Button
with Recessed
Plunger

On Line

Paper Out

Paper
Feed
Button

Paper Feed

**Alternate Version
Operator Panel
(Remote Printer)**

```
   7193  Thermal  Printer
      - Silent
         - Swift:   17 LPS
            - Simple


   Firmware  CRC  is  2789


            Switches
1      2      3      4      5      6
OFF    OFF    OFF    OFF    ON     OFF


            Straps
RS232  comm        no  Knife
Remote  power


   Non-volatile  memory
RS232  setup
-print  ?  for  error
-4K  data  buffer
-improved  Busy  line


Thermal  Head  Setting  1
Partial  Cut  Setting   5
Datascope  Mode         OFF
Default  lines/inch  7.6
Print  and  feed  w/  <CR>


print  lines    9,233,021
  knife  cuts             0
     hours  on          741



     CODE  PAGE  437
  ! " # $ % & ' ( ) * + , - . / 0 1 2 3 4 5
6 7 8 9 : ; < = > ? @ A B C D E F G H I J K
L M N O P Q R S T U V W X Y Z [ \ ] ^ _ ` a
b c d e f g h i j k l m n o p q r s t u v w
x y z { | } ~ ⌂ Ç ü é â ä à å ç ê ë è ï î ì
Ä Å É æ Æ ô ö ò û ù ÿ Ö Ü ¢ £ ¥
ñ Ñ ª º ¿ ⌐ ¬ ½ ¼ ¡
```

Sample Test Print

Mounting the Printer on a Wall

Use the wall-mount kit to mount the printer vertically on a wall. See "Ordering Other Supplies" in chapter 1 for information on ordering the printer wall-mount kit.

The kit contains a mounting bracket, screws with plastic anchors, and a label. Once the printer is mounted on the wall, the operator panel will be upside down. The label corrects this so the panel can be easily read.

Select a wall that is accessible, but away from main traffic to keep the printer from being bumped or knocked off. Be sure there are no hidden wires or other obstructions in the wall where you mount the printer. Keep in mind the length of the cables when mounting the printer on the wall.

You will need a 1/4 inch drill bit (approximately 6 mm) and either a Phillips or standard screwdriver (screws are combination Phillips and pan-slotted).

1. Using the bracket as a template, mark and drill a hole for each plastic anchor 32 mm (1.25 inches) deep.

2. Insert the anchors into the holes so they are flush with the wall surface and screw the bracket against the wall, tightening the screws so that the plastic anchors expand and hold firmly in the wall.

    Do not overly tighten the screws.

Note: Because the power cable and communication cable connect to the bottom of the printer, they must be connected before the printer can be attached to the bracket. If you haven't connected the cables to the printer, do so now. See "Connecting Communication and Power Cables" earlier in this chapter.

3. Line up the tabs of the bracket with the slots on the back of the printer and attach the printer to the bracket.

4. Place the label on the cover.

158.5mm
6.24 in.

69.8mm
2.75 in.

79.2mm
3.12 in.

31.8mm
1.25 in.

158.5mm
6.24 in.

30.5mm
1.20 in.

19.5mm
0.75 in.

19.5mm
0.75 in.

Screws

Plastic
Anchors

Bracket

Slots

Tabs

Bracket

Back of
the Center

**7193
Printer**

Paper Feed

Paper Out

Paper
Release

On Line

Label

Paper Feed

Paper Out

On Line

**Operator
Panel**
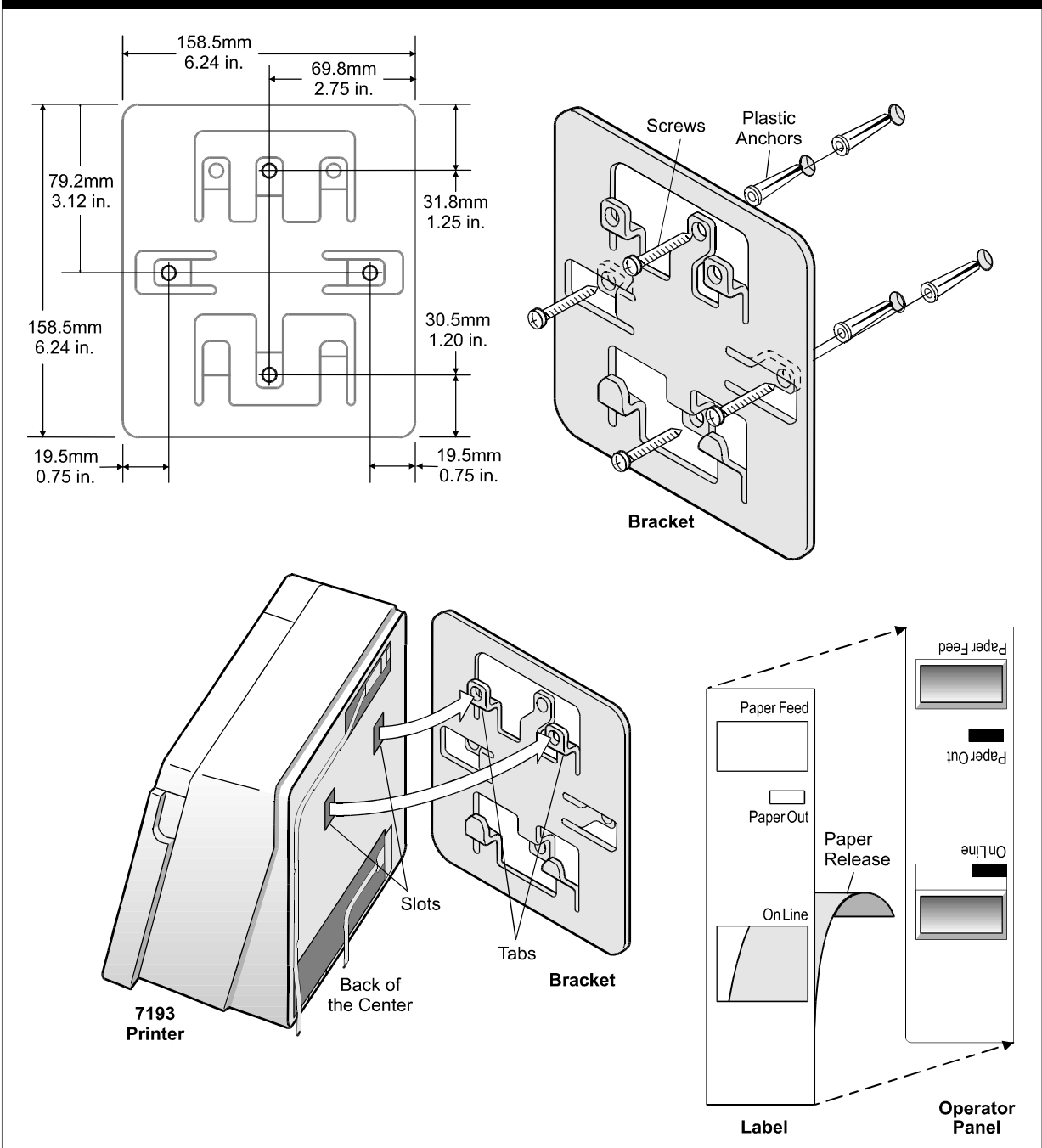
Mounting the Power Supply on a Wall

The power supply can be ordered with a wall-mount kit to mount the power supply on the wall or under a table. See "Ordering Other Supplies" in chapter 1 for information on ordering the power supply with or without a wall-mount kit.

The kit contains a holder and screws with plastic anchors. Be sure there are no hidden wires or other obstructions in the wall where you mount the power supply.

You will need a 1/4 inch drill bit (approximately 6 mm) and either a Phillips or standard screwdriver (screws are combination Phillips and pan-slotted).

1. Using the bracket as a template, mark and drill a hole for each plastic anchor 32 mm (1.25 inches) deep.

2. Insert the anchors into the holes so they are flush with the wall surface and screw the holder against the wall, tightening the screws so that the plastic anchors expand and hold firmly in the wall.

   Do not overly tighten the screws.

Note: You must unplug the power cord in order to place the power supply in the holder. First, take the printer off-line by pressing the On Line button on the operator panel (the On Line light goes off indicating the printer is off-line), unplug the power cord from the outlet, then unplug the power cord from the power supply.

3. Place the power supply in the holder.

4. Plug the power cord into the power supply.

5. Plug the power cord into an outlet.

Note: You can use the tie-wrap to wrap the power supply cable to keep it out of the way.

44.5mm
1.75 in.

19.1mm
.75 in.

21.8mm
.875 in.

Plastic
Anchor

57.2mm
2.25 in.

Screws

107.9mm
4.25 in.

141.8mm
5.58 in.

Holder

26.4mm
1.04 in.

96.0mm
3.78 in.

Power
Supply
Cable

**Power
Supply**

Holder

AC Cord
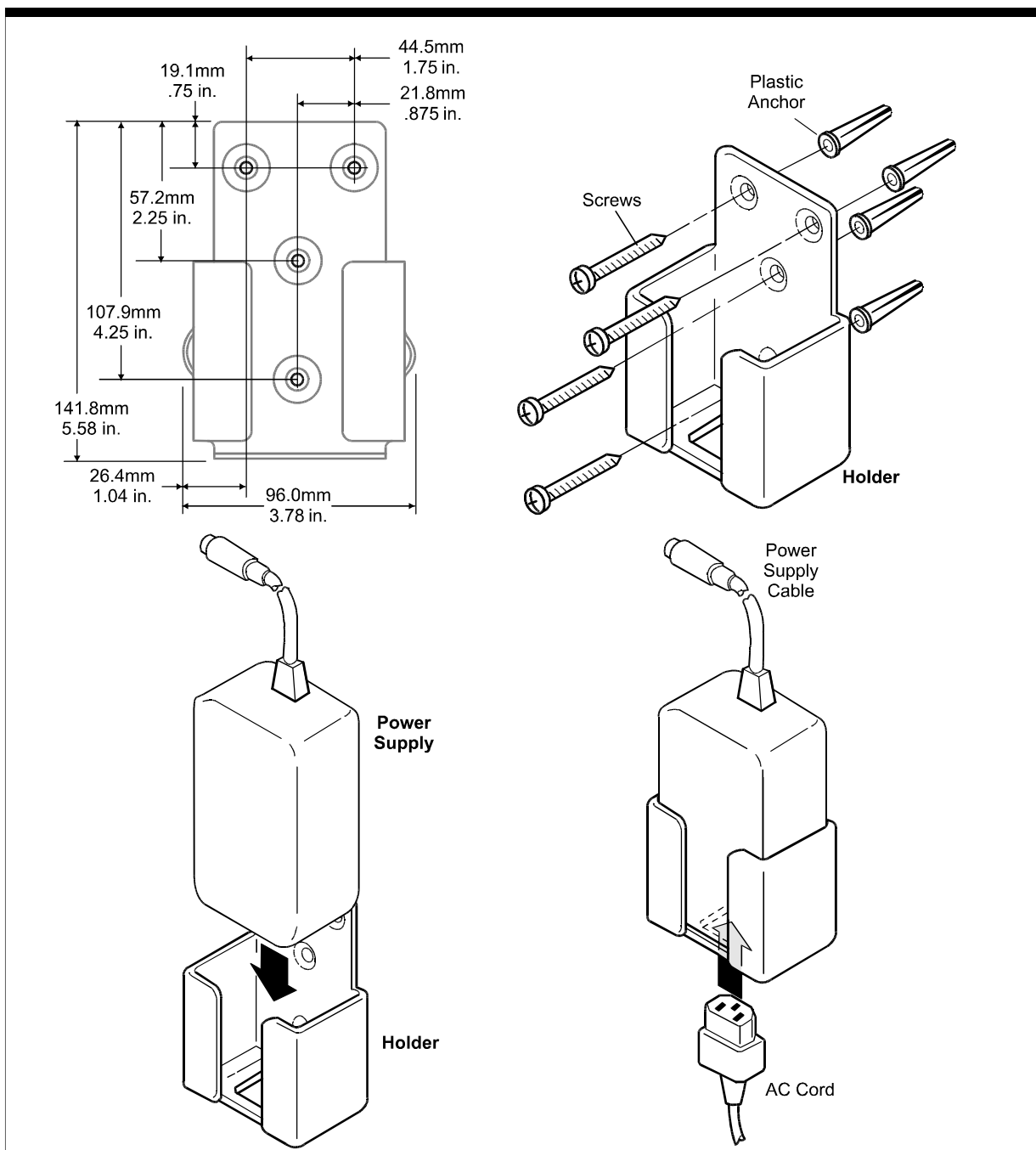
Chapter 3: Solving Problems

The 7193 printer is a simple, generally trouble-free printer, but from time to time minor problems may occur. For example, the power supply may be interrupted or the printhead may overheat for some reason.

Lights on the operator panel will signal that something may not be operating properly: one green light and one red light may either flash or glow continuously as described in the following table and on the following pages.

Operator Panel Lights

The following chart describes the operator panel lights. See "Correcting Problems" on the next page for more information about each of these conditions.

Light	Condition	Meaning	Action Required
Green[1]	On	Printer is on-line	None
Green[1]	Off	Printer is unplugged or off-line	Connect printer to host or power supply and turn on
Green[1]	Flashing	Printer is in diagnostics mode	Set DIP switch #1 to Off (see "Setting Switches," in chapter 2)
Red[2]	Off	No fault conditions	None
Red[2]	On	Paper out, cover open, or knife won't home	Reload paper, close cover, or clear paper jam
Red[2]	Flashing	Printhead too hot or voltages out of range	Wait for printhead to cool down

[1]Light labeled On Line.
[2]Light labeled Paper Out.

Correcting Problems

Operator-Correctable Conditions

The following conditions can be corrected generally without calling for service. However, if problems persist, contact your NCR authorized service representative to arrange for a service call.

Paper Out

Replace the paper roll. Do not operate the printer or host computer if the printer runs out of paper. The printer will not operate without paper, but it may continue to accept data from the host computer. Because the printer cannot print any transactions, the data may be lost.

See "Loading and Changing Paper" in chapter 2 for more information.

Knife Failure or Paper Jam

A problem or jam has occurred with the knife. Open the receipt cover and visually inspect the knife inside the cover. Clear any jammed paper you can see. Tear off any excess paper against the tear off blade.

Contact your NCR authorized service representative if this does not resolve the problem.

Receipt Cover Open

Check that the receipt cover is completely closed. You can tell if it is not closed properly if it swings open easily. When closed properly, it requires some exertion to open because of the snug fit.

Service-Related Problems

The following problems may require you to contact your NCR authorized service representative to correct the problem.

Print Head Over/Under Temperature

There is a problem with the temperature of the printhead. It must remain within a certain temperature range to operate properly. This problem will most often occur when the printhead overheats rather than running under temperature.

The printhead may overheat when printing in a room where the temperature is above the recommended operating temperature or when printing high density graphics continuously. In either case, the printer will shut off. See "Appendix A: Specifications" for information on the recommended temperature range for operating the printer and on the restrictions of printing high density graphics continuously.

If the operating temperature is too hot, adjust the room temperature or move the printer to a cooler location. If the printhead is overheating because of printing graphics continuously, reduce the demand on the printer.

If the printer continues to overheat, contact your NCR authorized service representative.

No Power to Printer or Power Voltages Incorrect

The power being supplied to the printer is not in the normal range. Check that all connections are correct. Make sure the power supply is plugged in and that the printer is on-line.

Contact your NCR authorized service representative if this does not resolve the problem.

Print is Light or Spotty

The printhead may be dirty. Clean it with cotton swabs and rubbing alcohol.

Caution: Do not spray the thermal printhead with household cleaner as this may damage it and the electronics.

If spotty or light printing problems persist after cleaning the thermal printhead, contact your NCR authorized service representative.

Note: The thermal printhead does not normally require cleaning if the recommended paper grades are used. If non-recommended paper has been used for an extended period of time, cleaning the printhead with alcohol will not be of much benefit. See "Ordering Thermal Paper" in chapter 1 for recommended paper.

Contacting a Service Representative

For serious problems, such as the ones mentioned in the previous section, contact your NCR authorized service representative to arrange for a service call.

Chapter 4: Diagnostics

The following diagnostic tests are available for the 7193:

- Level 0 Diagnostics
  Performed during the startup cycle

- Level 1 Diagnostics (setup mode)
  Available in a dedicated environment and accessed through the DIP Switches

- Level 2 Diagnostics
  Performed during normal printer operation

- Level 3 Diagnostics
  Maintained during normal operation and printed in the print test

Level 0 Diagnostics

The printer automatically performs level 0 diagnostics during the startup cycle when power is supplied or when the printer is put on-line. Level 0 diagnostics comprise the following actions:

- Motors are turned off

- Microprocessor timing is checked, CRC check of the firmware ROM is performed, external RAM is read

  Failure causes level 0 diagnostics to stop; the printer beeps once when the test is successfully completed.

- Checks if paper is present

- Homes knife

  Failure causes a fault condition.

- Checks if receipt cover is closed

  Failure does not interrupt the startup cycle.

When the last step is complete, the Paper Feed button is enabled and the printer is ready for normal operation. Information about the test is available to the communication interface through the commands.

If the printer has not been turned on before, or a new EEROM has been installed, the default values for the printer functions (set in Level 1 Diagnostics) will be loaded into the EEROM during level 0 diagnostics. The printer beeps twice when this occurs. See the tables in "Level 1 Diagnostics" for the printer settings. If the printer beeps twice at any other time, it indicates that the EEROM has failed.

Level 1 Diagnostics

Level 1 Diagnostics (setup mode) allow you to change settings for various printer functions (described on the following pages) and to run certain tests using the DIP switches.

Keep the following information in mind when changing the settings:

- Turn the printer off by pressing the On Line button (or plunger). Although the printer still receives power, this is sufficient for changing the DIP switches.

- The settings can only be changed when the printer is in level 1 diagnostics (setup mode): switch 1 must be set to On.

- Turn the printer back on. The printer beeps, and the On Line light (green) blinks.

- Once the settings have been changed and stored in the EEROM, the DIP switches must be set back to the on-line settings for the printer to operate.

- The stored settings for the functions are printed with a dump of all resident characters during a print test. See "Testing the Printer" in chapter 2.

- The default settings are set at the factory and are stored in the history EEROM.

Caution: If you change the switch settings, be sure they are correct for that particular function or test to avoid changing the settings for another function or test. If the settings are accidentally changed, see the tables in this section to change the settings back. If you need assistance, contact your NCR-authorized service representative.

The functions and tests are described in the following order in this section:

- Setting Data Error (RS-232C only) and Data Buffer options

- Setting printhead resistance

- Setting default lines per inch

- Setting partial cut distance

- Ignoring/using the carriage return

- Running the data scope mode

Setting Data Error and Data Buffer options

This function allows you to select the handling of data reception errors (RS-232C only) and to select the size of the data buffer.

Note: The operator panel may differ depending on the model. To turn the printer on or off, (on-line or off-line), use a paper clip or other pointed object to depress the plunger (in place of the On Line button) on models with that item.

Caution: The DIP switches are pre-set at the factory and should generally not be changed. If you must change them, do so carefully to avoid changing other functions. Run the print test to see the current settings for this function. See "Testing The Printer" in chapter 2.

1. Turn the printer off.

2. Turn the printer over and note what the current DIP switch settings are.

3. Set the switches for data reception errors and the data buffer.

Switch 1	Switch 2	Switch 3	Switch 4	Switch 5	Switch 6	Option
On	Off	On	Off	Off	Off	"?" for Data Errors (default)
On	Off	On	Off	Off	On	Ignore Data Errors
On	Off	On	Off	On	Off	4K Byte Data Buffer (default)

On	Off	On	Off	On	On	One Line Data Buffer

4. Turn the printer back on to enter the settings into the EEROM.

    The On Line light (green) blinks.

5. Turn the printer off and set the DIP switches to the former settings.

    DIP switch 1 must be Off to return the printer to the on-line mode.

6. Turn the printer back on.

Setting Printhead Resistance

This function allows you to change the setting for the printhead resistance. The setting must match the character (A-D, 0-3) stamped on the heatsink in back of the printhead. This is visible only by removing the L cover (operator panel) of the printer. Only a trained service representative may remove this cover.

Note: The operator panel may differ depending on the model. To turn the printer on or off, (on-line or off-line), use a paper clip or other pointed object to depress the plunger (in place of the On Line button) on models with that item.

Caution: The DIP switches are pre-set at the factory and should generally not be changed. If you must change them, do so carefully to avoid changing other functions. Run the print test to see the current settings for this function. See "Testing The Printer" in chapter 2.

1. Turn the printer off.

2. Turn the printer over and note what the current DIP switch settings are.

3. Set the switches to match the character stamped on the heatsink in back of the printhead.

						Printhead Setting	
Switch 1	Switch 2	Switch 3	Switch 4	Switch 5	Switch 6	Early 7193 Models*	Later 7193 Models*
On	On	On	Off	Off	Off	A	A
On	On	On	Off	Off	On	B	B
On	On	On	Off	On	Off	C	C
On	On	On	Off	On	On	D	D
On	On	On	On	Off	Off	E	3
On	On	On	On	Off	On	F	2
On	On	On	On	On	Off	G	1
On	On	On	On	On	On	H	0

*Be sure that the settings are correct for the version of the printer. A-D are the same for all printers. E-H is used for early models only, while 3, 2, 1, 0 are used for later models.

4. Turn the printer back on to enter the settings into the EEROM.

    The On Line light (green) blinks.

5. Turn the printer off and set the DIP switches to the former settings.

    DIP switch 1 must be Off to return the printer to the on-line mode.

6. Turn the printer back on.

Setting Default Lines per Inch

This function allows you to set the default for lines per inch to either 7.6 or 6.

Note: The operator panel may differ depending on the model. To turn the printer on or off, (on-line or off-line), use a paper clip or other pointed object to depress the plunger (in place of the On Line button) on models with that item.

Caution: The DIP switches are pre-set at the factory and should generally not be changed. If you must change them, do so carefully to avoid changing other functions. Run the print test to see the current settings for this function. See "Testing The Printer" in chapter 2.

1. Turn the printer off.

2. Turn the printer over and note what the current DIP switch settings are.

3. Set the switches to match the lines per inch setting you want as the default setting (when the printer is powered up).

Switch 1	Switch 2	Switch 3	Switch 4	Switch 5	Switch 6	Default Lines per Inch
On	Off	On	On	On	Off	7.6 (Factory Setting)
On	Off	On	On	On	On	6.0

4. Turn the printer back on to enter the settings into the EEROM.

    The On Line light (green) blinks.

5. Turn the printer off and set the DIP switches to the former settings.

    DIP switch 1 must be Off to return the printer to the on-line mode.

6. Turn the printer back on.

Setting Partial Cut Distance

This function allows you to change the length of the partial knife cut: the higher the number, the longer the cut.

Note: The operator panel may differ depending on the model. To turn the printer on or off, (on-line or off-line), use a paper clip or other pointed object to depress the plunger (in place of the On Line button) on models with that item.

Caution: The DIP switches are pre-set at the factory and should generally not be changed. If you must change them, do so carefully to avoid changing other functions. Run the print test to see the current settings for this function. See "Testing The Printer" in chapter 2.

1. Turn the printer off.

2. Turn the printer over and note what the current DIP switch settings are.

3. Set the switches to match the cut distance value you want (the higher the number, the longer the cut).

Switch 1	Switch 2	Switch 3	Switch 4	Switch 5	Switch 6	Cut Distance Value
On	On	Off	Off	Off	Off	0
On	On	Off	Off	Off	On	1
On	On	Off	Off	On	Off	2
On	On	Off	Off	On	On	3
On	On	Off	On	Off	Off	4
On	On	Off	On	Off	On	5 (Default)
On	On	Off	On	On	Off	6
On	On	Off	On	On	On	7

4. Turn the printer back on to enter the settings into the EEROM.

    The On Line light (green) blinks.

5. Turn the printer off and set the DIP switches to the former settings.

    DIP switch 1 must be Off to return the printer to the on-line mode.

6. Turn the printer back on.

Ignoring/Using the Carriage Return

This function allows the printer to ignore or use the Carriage Return (hexadecimal 0D) command depending on the application. Some applications expect the command to be ignored while others use the command as a print command.

Note: The operator panel may differ depending on the model. To turn the printer on or off, (on-line or off-line), use a paper clip or other pointed object to depress the plunger (in place of the On Line button) on models with that item.

Caution: The DIP switches are pre-set at the factory and should generally not be changed. If you must change them, do so carefully to avoid changing other functions.

1. Turn the printer off.

2. Turn the printer over and note what the current DIP switch settings are.

3. Set the switches for ignoring or using the Carriage Return command.

Switch 1	Switch 2	Switch 3	Switch 4	Switch 5	Switch 6	Option
On	Off	On	On	Off	On	Ignore CR (Hex 0D)
On	Off	On	On	Off	Off	Use CR (Hex 0D) as Print Command (Default)*

*Emulates the NCR 7150™ printer.

4. Turn the printer back on to enter the settings into the EEROM.

    The On Line light (green) blinks.

5. Turn the printer off and set the DIP switches to the former settings.

DIP switch 1 must be Off to return the printer to the on-line mode.

6.   Turn the printer back on.

Running the Data Scope Mode

This test prints a hexadecimal dump of all data sent to the printer: "1" prints as hexadecimal 31, "A" as hexadecimal 41 and so on. This helps troubleshoot communication problems and runs during a normal application (after being enabled in level 1 diagnostics).

Enter the Data Scope Mode

Note: The operator panel may differ depending on the model. To turn the printer on or off, (on-line or off-line), use a paper clip or other pointed object to depress the plunger (in place of the On Line button) on models with that item.

Caution: The DIP switches are pre-set at the factory and should generally not be changed. If you must change them, do so carefully to avoid changing other functions.

1.   Turn the printer off.

2.   Turn the printer over and note what the current DIP switch settings are.

3.   Set the switches to the settings in the table.

Switch 1	Switch 2	Switch 3	Switch 4	Switch 5	Switch 6
On	Off	Off	On	Off	On

4.   Turn the printer on to enter the settings into the EEROM and enable Data Scope Mode.

The On Line light (green) blinks.

5.   Turn the printer off and set the DIP switches to the former settings.

DIP switch 1 must be Off to return the printer to the on-line mode.

6.   Turn the printer back on.

The printer is on-line and can communicate with the host computer.

7.   Run a transaction from the host computer.

All commands and data sent from the host computer will be printed as hexadecimal characters as shown in the illustration.

```
1BH
61H 00H 1BH 64H 06H 1BH 6DH 16H 0CH 1BH 21H
30H 20H 37H 31H 35H 36H 20H 54H 68H 65H 72H
6DH 61H 6CH 2FH 49H 6DH 70H 61H 63H 74H 0AH
1BH 21H 20H 54H 54H 77H 6FH 20H 48H 65H 61H
```

Datascope Mode Print Test

Exit the Data Scope Mode

1.   Turn the printer off.

2. Set the switches to the settings in the table.

Switch 1	Switch 2	Switch 3	Switch 4	Switch 5	Switch 6
On	Off	Off	On	Off	Off

3. Turn the printer back on to enter the settings into the EEROM and disable the Data Scope Mode.

   The On Line light (green) blinks.

4. Turn the printer off and set the DIP switches to the former settings.

   DIP switch 1 must be Off to return the printer to the on-line mode.

5. Turn the printer back on.

   The printer is on-line and can communicate normally with the host computer.

Testing Receipt Printing

This function allows you to select various print tests. You can also test the printing by following the procedures in "Testing the Printer" in chapter 2 without having to change the DIP switches. A sample test printout is in chapter 2.
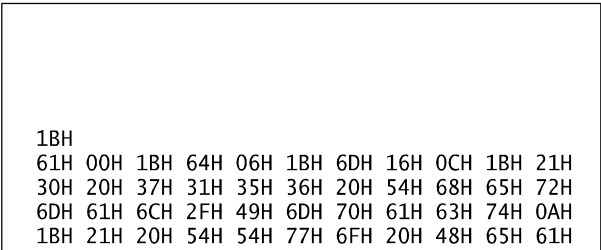
Note: The operator panel may differ depending on the model. To turn the printer on or off, (on-line or off-line), use a paper clip or other pointed object to depress the plunger (in place of the On Line button) on models with that item.

Caution: The DIP switches are pre-set at the factory and should generally not be changed. If you must change them, do so carefully to avoid changing other functions.

1. Turn the printer off.

2. Turn the printer over and note what the current DIP switch settings are.

3. Set the switches for the test you want.

Switch 1	Switch 2	Switch 3	Switch 4	Switch 5	Switch 6	Option
On	Off	Off	Off	Off	Off	Sample Receipt
On	Off	Off	Off	Off	On	Continuous Sample Receipt
On	Off	Off	Off	On	Off	Character Sets
On	Off	Off	Off	On	On	Continuous Character Sets

4. Turn the printer back on to enter the settings into the EEROM.

   The On Line light (green) blinks. If either the continuous sample receipt or the continuous character sets option is selected, the printer will automatically begin printing.

5. Press the Paper Feed button to print the sample receipt or the character sets (whichever was selected).

6. Press the Paper Feed button or turn the printer off to stop the test.

7. Turn the printer off and set the DIP switches to the former settings.

   DIP switch 1 must be Off to return the printer to the on-line mode.

8. Turn the printer back on.

Level 2 Diagnostics

Level 2 diagnostics run during normal printer operation. When the following conditions occur, the printer automatically turns off the appropriate motors and disables printing to prevent damage:

- Paper out, cover off, or knife unable to home
- Printhead too hot or voltages out of range

The lights on the operator panel will signal when these conditions occur as well as indicate what state or mode the printer is in. See "Chapter 3: Solving Problems" for a table describing the operator panel lights and for general troubleshooting information.

Level 3 Diagnostics

Level 3 diagnostics keep track of the following tallies and prints them on the receipt during the print test. See the sample test printout in chapter 2.

- Number of lines printed
- Number of knife cuts
- Number of hours the printer has been on

Chapter 5: Communication

Communication Overview

In order for a receipt to be printed, a program must be in place that translates the data from the host computer into a language that the printer can understand. This program must tell the printer exactly how to print each character. This chapter describes how to create such a program or modify an existing one.

Interfaces

In order for the printer to communicate with the host, a communication link must be set up. The 7193 supports the following communication interfaces:

- RS-232C Interface
- Parallel Interface

Each of these has a protocol associated with it that the host must understand and adhere to. Only when the interface parameters are matched and the proper protocol is used will the host and the printer be able to communicate. See the respective sections in this chapter for a description of the protocol associated with each type of interface.

Sending Commands

Once the communication link is established, commands can be sent to the printer. This section describes how to send commands to the printer using DOS and BASIC. This section does not take into account the necessary protocol, but is meant as a general introduction to how the printer functions.

Using DOS to Send Commands

One way of getting commands to the printer is to send them directly from DOS. For example, the command

```
COPY CON: COM1:
```

sets the computer up such that the hexadecimal code corresponding to any key that was pressed would be sent to the communication port COM1 when the COPY mode is exited. If the printer is connected to COM1, then the data will go to the printer.

Exit the COPY mode by typing

```
CTRL Z
```

and then pressing the ENTER key. Once the computer knows to direct data from any print command to the proper port, commands can be sent from any software program.

Using BASIC to Send Commands

In BASIC, printer commands are sent as a string of characters preceded by the LPRINT command. For example,

```
LPRINT CHR$(&H0A)
```

sends the hexadecimal number 0A to the printer, which causes the printer to print the contents of its print buffer. Previously sent commands tell the printer exactly how this data should appear on the paper. For example,

```
LPRINT CHR$(&H12); "ABC"; CHR$(&H0A)
```

sends the hexadecimal numbers 12 41 42 43 0A to the printer. This causes the printer to set itself to double wide mode (12), load the print buffer with "ABC" (41 42 43), and finally, print (0A). Again, the communication link that the BASIC program outputs to must be matched to that of the printer.

RS-232C Interface

The RS-232C interface uses either XON/XOFF or DTR/DSR protocol. For XON/XOFF, a particular character is sent back and forth between the host and the printer to regulate the communication. For DTR/DSR, changes in the DTR/DSR signal coordinate the information flow.

The RS-232C version of the 7193 offers the standard options which are selected with the DIP switches. See "RS-232C Switch Settings" later in this chapter for the switch settings.

Print Speed and Timing

The faster speed of new 7193 models requires the application to send data to the printer at least as fast as it is printed. The application must also allow receipt lines to be buffered ahead at the printer, so the printer will be able to print each line immediately after the preceding line, without stopping to wait for more data. Ideally, the application will send all the data for an entire receipt without pausing between characters or lines transmitted.

If the application sends data at 9600 baud and pauses between lines for as short a time as 50 milliseconds, the printer will never be able to print at full speed. However, if the application sends data at 19.2 K baud and does not pause between lines, the printer will be able to print at its full speed of 1020 lines/minute.

The table shows that with a pause of 50 milliseconds after each line, the transmit time equals or exceeds the print time, slowing down the printer, regardless of the baud rate.

| Characters/Line	Lines/Receipt	Transmit Time: (9600 Baud)	Transmit Time: (19.2 K Baud)	Print Time
20	20	1.4 Seconds	1.2 Seconds	1.2 Seconds
20	40	2.8 Seconds	2.4 Seconds	2.4 Seconds
44	20	1.88 Seconds	1.44 Seconds	1.2 Seconds
44	40	3.76 Seconds	2.88 Seconds	2.4 Seconds

The next table shows that with no delay between lines, the transmit time is much less than the print time, allowing the printer to print at full speed.

Characters/Line	Lines/Receipt	Transmit Time: (9600 Baud)	Transmit Time: (19.2 K Baud)	Print Time
20	20	0.4 Seconds	0.2 Seconds	1.2 Seconds
20	40	0.8 Seconds	0.4 Seconds	2.4 Seconds
44	20	0.88 Seconds	0.44 Seconds	1.2 Seconds
44	40	1.76 Seconds	0.88 Seconds	2.4 Seconds

XON/XOFF Protocol

The XON/XOFF characters coordinate the information transfer between the printer and the host computer. The printer sends an XON character when it is ready to receive data and it sends an XOFF character when it cannot accept any more data. The software on the host computer must monitor the communication link as shown in the following flowchart in order to send data at the appropriate times.

If XON/XOFF has been selected, the printer also toggles the DTR signal, as described in the next section, but it does not look at the DSR signal to transmit data.
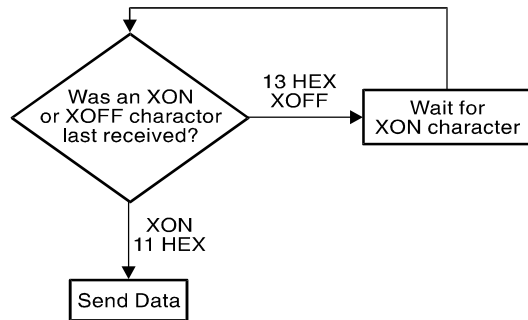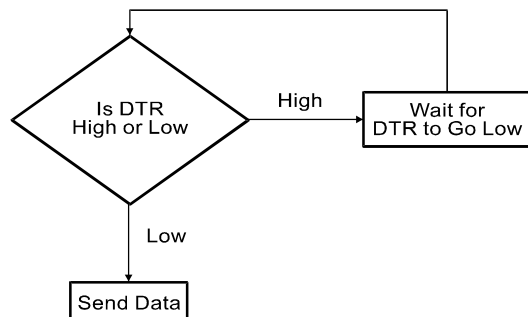

XON character = hexadecimal 11.
XOFF character = hexadecimal 13.

DTR/DSR Protocol

The DTR signal is used to control data transmission to the printer. It is driven low when the printer is ready to recieve data and driven high when it cannot accept any more data. Data is transmitted from the printer after it confirms that the DSR signal is low.

RS-232C Technical Specifications

This section describes the pin settings for the connectors and the RS-232C interface parameters. The RS-232C parameters are selected by setting the DIP switches on the printed circuit board. See "RS-232C Switch Settings" on the next page for the position of the DIP switches. The RS-232C parameters must match those of the host computer.

Connectors

The following illustration shows the RS-232C communication connector and pin assignments. The connector is a 9-pin male D-shell connector and is located in the hollow cavity under the printer.
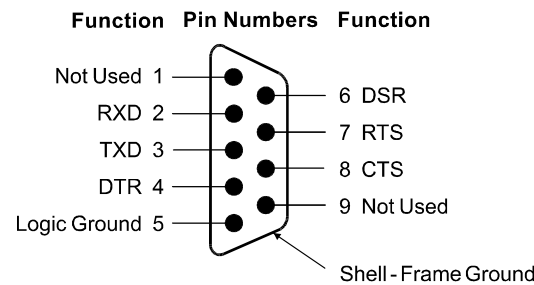
With RS-232C, the 7193 is always remotely powered. The following illustration shows the power cable connector and pin assignments. The power cable connector is 6-pin mini DIN plug and is located in the small cavity under the printer at the front.
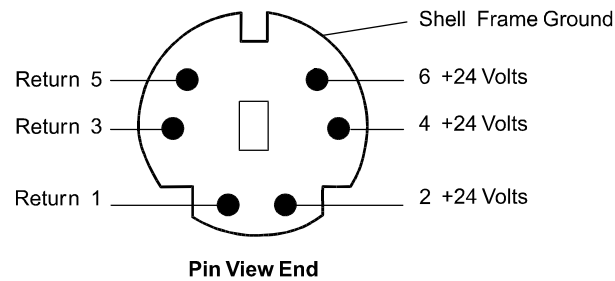
Cash Drawer Connectors

The following illustration shows the pinouts for the cash drawer connector.
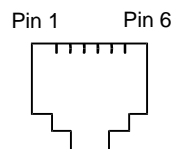
The following table shows the pinouts for cash drawers 1 and 2. The cash drawer connectors are located at the rear of the printer.

RS-232C Printers

| Pin Number	Cash Drawer 1 Connector	Cash Drawer 2 Connector
1	Frame Ground	Frame Ground
2	Drawer 1 Solenoid	Drawer 2 Solenoid (Remove jumper JPR2 to disable)
3	Drawer 1 Status Switch	Drawer 2 Status Switch
4	+24 Volts (to Solenoid +)	+24 Volts (to Solenoid +)
5	Drawer 2 Solenoid (Remove jumper JPR3 to disable)	Drawer 1 Solenoid
6	Ground (Status Switch Return)	Ground (Status Switch Return)

RS-232C Switch Settings

The DIP switches are located on the printed circuit board and are accessed from the bottom of the printer. You do not need to remove any covers to change the DIP switches.

The DIP switches are used to set the RS-232C parameters and the Data Error and Data Buffer options as shown. These parameters must match those of the host computer in order for the host computer and the printer to communicate.

Caution: The switches can also be used for setting other functions and tests. Be careful when setting the switches for the RS-232C settings that you do not accidentally change the settings for the other functions and tests. See "Level 1 Diagnostics" in chapter 4 for more information.

DIP Switches
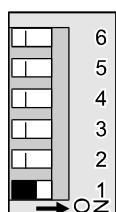
Switch 1 is shown
in the ON position

Use a paper clip or other pointed object to set the switches.

Note: The operator panel may differ depending on the model. To turn the printer on or off, (on-line or off-line), use a paper clip or other pointed object to depress the plunger (in place of the On Line button) on models with that item.

1. Press the On Line button (or plunger) to put the printer off-line.

2. Turn the printer over and set the switches to the desired settings shown in the table.

   Switch 1 must be set to Off when setting switches for the RS-232C settings. This puts the printer in the on-line mode to communicate with the host computer.

Caution: Do not set DIP switch 1 to On. Setting switch 1 to On puts the printer in level 1 diagnostics (setup) mode where other functions and tests can be changed.

DIP Switch Settings for RS-232C Parameters

Switch	Settings		Description
1	OFF		On-line Mode (default)
	ON		Level 1 Diagnostics (setup mode)
2	OFF		DTR/DSR Protocol (default)
	ON		XON/XOFF Protocol
3	OFF		Without Parity (default)
	ON		With Parity
4*	OFF		Odd Parity
	ON		Even Parity
5, 6	5	6	
	OFF	OFF	19,200 Baud
	ON	OFF	9600 Baud (default)
	OFF	ON	4800 Baud
	ON	ON	1200 Baud

*Switch 4 is not used if the parity is disabled (switch 3 set to OFF).

Note: The following options are set with the printer in the setup mode. See "Level 1 Diagnostics" in chapter 4 for more information.

DIP Switch Settings for Data Error and Data Buffer Options (Choose one from each option)

Switch 1	Switch 2	Switch 3	Switch 4	Switch 5	Switch 6	Option
On	Off	On	Off	Off	Off	"?" for Data Errors (Default)
On	Off	On	Off	Off	On	Ignore Data Errors
On	Off	On	Off	On	Off	4K Byte Data Buffer (Default)
On	Off	On	Off	On	On	One Line Data Buffer

Note: Other settings not used.

Parallel Interface

Parallel Protocol

The 7193 uses a standard PC-compatible parallel interface. The illustration shows the timing diagram for the interface protocol.
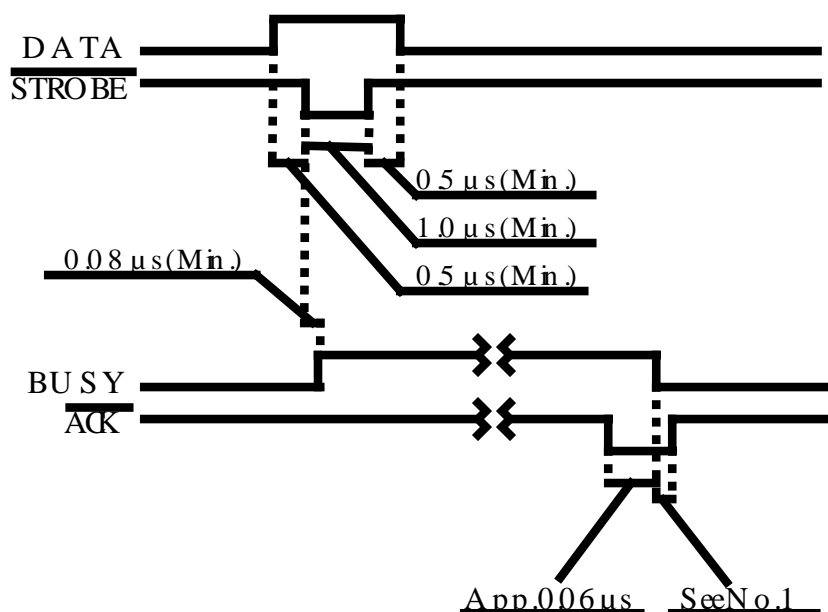
1. ACK/ will not go high until STROBE/ goes high.

2. When the printer is not ready to receive more data, ACK/ will be sent, but BUSY will remain high.

3. When the power is turned on or the printer is reset, an ACK/ will be sent during initialization.

4. Typical time from STROBE/ to ACK/ is approximately 44 μ seconds.

Parallel Technical Specifications

Parallel Connectors

The following illustration shows the Parallel communication connector and pin assignments. The connector is at the rear of the printer.
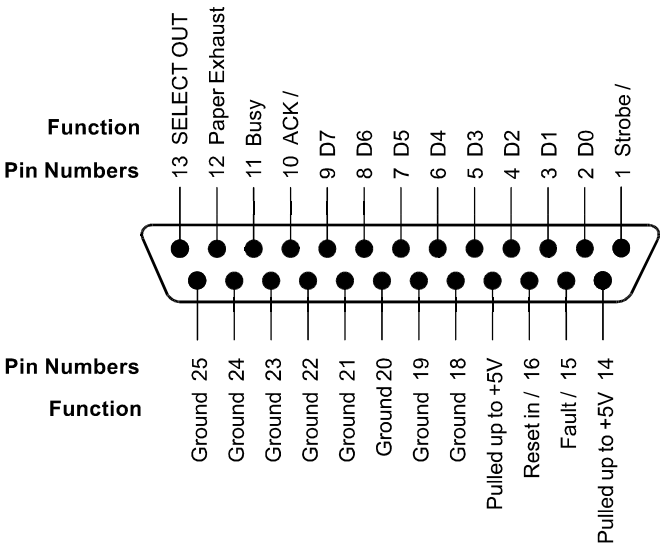
The connector for the power supply cable has the following pin assignments. The power cable connector is in the small cavity under the printer at the front.
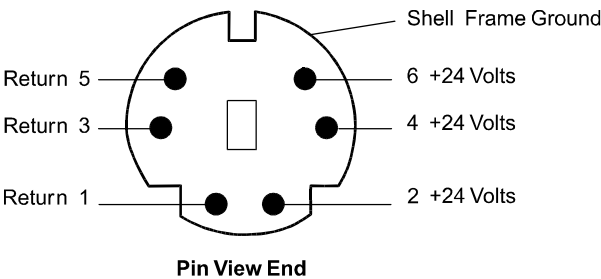
Pin View End

Cash Drawer Connectors

The following illustration shows the pinouts for the cash drawer connector.
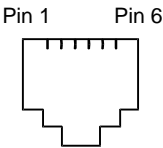
The following table shows the pinouts for cash drawers 1 and 2. The cash drawer connectors are located at the rear of the printer.

Parallel Printers

Pin Number	Cash Drawer 1 Connector	Cash Drawer 2 Connector
1	Frame Ground	Frame Ground
2	Drawer 1 Solenoid	Drawer 2 Solenoid (Remove jumper JPR4 to disable)
3	Drawer 1 Status Switch	Drawer 2 Status Switch
4	+24 Volts (to Solenoid +)	+24 Volts (to Solenoid +)
5	Drawer 2 Solenoid (Remove jumper JPR3 to disable)	Drawer 1 Solenoid
6	Ground (Status Switch Return)	Ground (Status Switch Return)

Parallel Switch Settings

When switch 1 is set to Off, the printer is on-line and ready to communicate with the host computer. For systems using non-standard ACK handshaking, this option is on Switch 2. DO NOT select the ACK handshaking option without fully understanding your system requirements.

Switch 1	Switch 2	Switch 3	Switch 4	Switch 5	Switch 6	Option
Off	On	Off	Off	Off	Off	ACK Handshaking (On-line)
Off	Off	Off	Off	Off	Off	Standard Busy Handshaking (On-line)

**Caution:** The switches can also be used for setting other functions and tests. Be careful when setting the switches for the Data Buffer settings that you do not accidentally change the settings for the other functions and tests.

Note: The Data Buffer option is set with the printer in the setup mode. See the table below, and see "Level 1 Diagnostics" in the "Diagnostics" chapter for more information.

Switch 1	Switch 2	Switch 3	Switch 4	Switch 5	Switch 6	Option
On	Off	On	Off	On	Off	4K Byte Data Buffer (Default)
On	Off	On	Off	On	On	One Line Data Buffer

Chapter 6: Commands

The commands control all operations and functions of the 7193 printer, from selecting the size and placement of characters and graphics on the receipt to feeding and cutting the paper.

Note: All versions of the 7193 use the same commands as listed in this section unless otherwise noted. For example, the Parallel interface requires unique commands for controlling the cash drawer.

The 7193 commands emulate two printers: the NCR 7150™ Multifunction printer and the Epson TM-T80™ Thermal printer. Any of the commands from either set may be used in any combination to program a host computer to communicate with the 7193 (unless otherwise noted).

Some commands listed and described here are not implemented in the 7193 (they are identified as not implemented). If received, they are ignored and not sent to the print buffer as data. Non-legal commands are sent to the print buffer as data.

Command List

This section groups the commands according to the following categories:
- Printer Function Commands
- Print Characteristics Commands
- Graphics Commands
- Printer Status Commands
- Real Time Commands
- Bar Code Commands

Within each group, the commands are listed in numerical order of their hexadecimal codes. The page number refers to where a complete description of each command is given in the "Command Descriptions" section which begins on page 47.

Printer Function Commands

These commands control the following basic printer functions and are listed in numerical order of their hexadecimal codes:
- Printing
- Feeding the paper
- Resetting the printer
- Cutting the paper
- Opening the cash drawers
- Defining the print area

Printer Function Commands

Hexadecimal Code	Command	Page
09	Horizontal Tab	47
0A	Line Feed	47
0D	Carriage Return	47
10	Clear Printer	48
14 *n*	Feed *n* Print Lines	48
15 *n*	Feed *n* Dot Rows	48
16 *n*	Add *n* Extra Dot Rows	48
17	Print	49
19 1B 69	Full Knife Cut	49
1A 1B 6D	Partial Knife Cut	49
1B 07	Generate Tone	49
1B 14 *n*	Set Column	49
1B 20 *n*	Set Character Right Side Spacing (Not Implemented)	49
1B 24, etc.	Set Absolute Starting Position	50
1B 32	Set Line Spacing to 1/6 Inch	50
1B 33 *n*	Set Line Spacing to *n* Minimum Units	50
1B 3D *n*	Select Peripheral Device	51
1B 40	Initialize Printer	51
1B 44, etc.	Set Horizontal Tab Positions	51
1B 4A *n*	Print and Feed *n* Minimum Units	51
1B 5C, etc.	Set Relative Starting Position	52
1B 61 *n*	Align Character Positions	53
1B 63 34 *n*	Select Sensors to Stop Printing (Not Implemented)	53
1B 63 35 *n*	Enable or Disable Panel Switch	53
1B 64 *n*	Print and Feed *n* Lines	53
1B 6A *k*	Read from Non-Volatile Memory	53
1B 70 *n*, etc.	Generate Pulse to Open Cash Drawer	53
1B 73 *n*, etc.	Write to Non-Volatile Memory	54
1D 4C *n n*	Set Left Margin	54
1D 50 *x y*	Set Horizontal and Vertical Minimum Motion Units	55
1D 56 *m* 1D 56 *m n*	Select Cut Mode and Cut Paper	55
1D 57 *nL nH*	Set Printing Area Width	56

Print Characteristics Commands

These commands control what the printed information looks like and are listed in numerical order of their hexadecimal codes.

Print Characteristics Commands

Hexadecimal Code	Command	Page
12	Select Double-Wide Characters	56
13	Select Single-Wide Characters	57
1B 12	Rotate Characters Counter-Clockwise	57
1B 16 *n*	Select Pitch (Column Width)	57
1B 21 *m*	Set Print Mode	57
1B 25 *n*	Select Character Set	58
1B 26, etc.	Define User-Defined Character Set	58
1B 3A 0 0 0	Copy Character Set From ROM to RAM	59
1B 3F *n*	Cancel User-Defined Character	59
1B 52 *n*	Select Character Code Table	59
1B 74 *n*		
1B 56 *n*	Set or Cancel Rotated Characters Clockwise	59
1B 7B *n*	Set or Cancel Upside-Down Characters	59

Graphics Commands

These commands print graphics data and are listed in numerical order of their hexadecimal codes.

Graphics Commands

Hexadecimal Code	Command	Page
1B 24, etc.	Set Absolute Starting Position[1]	60
1B 2A *m*, etc.	Set Bit Image Mode	61
1B 4B, etc.	Single-Density Graphics	62
1B 4C, etc.	Double-Density Graphics	62
1B 59, etc.		
1D 2A, etc.	Define Downloaded Bit Image	63
1D 2F *m*	Print Downloaded Bit Image	63

[1]This printer function command is also used in graphics to emulate an Epson LQ-950™ printer to handle graphics output from word processing programs.

Printer Status Commands

These commands send printer status information to the host computer and are listed in numerical order of their hexadecimal codes.

Printer Status Commands

Hexadecimal Code	Command	Page
1B 75 0	Transmit Cash Drawer Status (RS-232C Only)	64
1B 75 n	Request Alternate Status (Parallel Only)	64
1B 76	Transmit Printer Status (Not Implemented for Parallel)	65
1D 49 n	Transmit Printer ID	65
1D 61 n	Enable/Disable Automatic Status Back	66
1D 72 n	Transmit Status	69

Real Time Commands

These commands provide an application interface to the printer even when the printer is not handling other commands (RS-232C communication interface only) and are listed in numerical order of their Hex codes.

Real Time Commands

Hexadecimal Code	Command	Page
10 04 n	Real Time Status Transmission, DLE Sequence	73
10 05 n	Real Time Request to Printer, DLE Sequence	75
1D 03 n	Real Time Request to Printer, GS Sequence	76
1D 04 n	Real Time Status Transmission, GS Sequence	76
1D 05	Real Time Printer Status Transmission	76

Bar Code Commands

These commands print bar codes. HRI means Human Readable Interface. The commands are listed in numerical order of their hexadecimal codes.

Bar Code Commands

Hexadecimal Code	Command	Page
1D 48 n	Select Printing Position of HRI Characters	77
1D 66 n	Select Pitch for HRI Characters (Not Implemented)	78
1D 68 n	Select Height of Bar Code	78
1D 6B n, etc.	Print Bar Code	78
1D 77 n	Select Width of Bar Code	80

Command Descriptions

This section lists the commands with their hexadecimal, decimal, and ASCII codes. The commands are grouped in the following categories:

- Printer Function Commands
- Print Characteristics Commands
- Graphics Commands
- Printer Status Commands
- Real Time Commands
- Bar Code Commands

Printer Function Commands

The printer function commands control the following basic printer functions and are described in order of their hexadecimal codes:

- Printing
- Feeding the paper
- Resetting the printer
- Cutting the paper
- Opening the cash drawers
- Defining the print area

Horizontal Tab

Moves the print position to the next tab position set by the Set Horizontal Tab Positions (1B 44 *n*1 ... *n*32 00) command. The print position is set to column one after each line.

Hexadecimal	Decimal	ASCII
09	9	HT

Line Feed

Prints one line from the buffer and feeds paper one line.

Hexadecimal	Decimal	ASCII
0A	10	LF

Carriage Return

Prints one line from the buffer and feeds paper one line. The printer can be set through the DIP switches to ignore or use this command. Some applications expect the command to be ignored while others use it as print command. See "Ignoring/Using the Carriage Return" in chapter 4 for more information.

Hexadecimal	Decimal	ASCII
0D	13	CR

Clear Printer

Clears the print line buffer without printing and sets the printer to the following condition:

- Double-Wide (12) command is cancelled
- Line Spacing, Pitch, and User-Defined Character Sets are maintained at current selections (RAM is not affected)
- Single-Wide, Single-High, Non-Rotated, and Left-Aligned characters are set
- Printer is restarted and error status is cleared in a fault condition
- Returns paper exhaust to the paper status line if an alternate status has been requested (Parallel interface only)

Hexadecimal	Decimal	ASCII
10	16	DLE

Feed *n* Print Lines

Feeds the paper *n* lines at the current line height without printing.

Hexadecimal	Decimal	ASCII	Value of *n*
14 *n*	20 *n*	DC4 *n*	0-127

Feed *n* Dot Rows

Feeds the paper *n* dot rows ($n/152$ inch, $n/6$ mm), without printing.

Hexadecimal	Decimal	ASCII	Value of *n*	Receipt	Slip
15 *n*	21 *n*	NAK *n*	0-127	$n/152$ inch	$n/72$ inch

Add *n* Extra Dot Rows

Adds *n* extra dot rows ($n/152$ inch, $n/6$ mm) to the character height to increase space between print lines or decrease the number of lines per inch.

Hexadecimal	Decimal	ASCII	Value of *n*	Default
16 *n*	22 *n*	SYN *n*	0-12	2

The following table shows the relationship between the number of lines per inch and each extra dot row added:

Extra Rows	Lines Per Inch	Dot Rows	Extra Rows	Lines Per Inch	Dot Rows
0	8.5	18	7	6.1	25
1	8.0	19	8	5.9	26
2	7.6	20	9	5.6	27
3	7.2	21	10	5.4	28
4	7.0	22	11	5.2	29
5	6.6	23	12	5.1	30
6	6.3	24			

Print

Prints one line from the buffer and feeds paper one line.

Hexadecimal	Decimal	ASCII
17	23	ETB

Full Knife Cut

This command is implemented the same as Partial Knife Cut (1A/1B 6D).

Hexadecimal	Decimal	ASCII
19	25	EM
1B 69	27 105	ESC i

Partial Knife Cut

Partially cuts the receipt, leaving .20 inch (5 mm) of paper. The length of the cut can be changed through the DIP switches. See "Setting Partial Cut Distance" in chapter 4. The cut edge is 108 dot rows or .71 inch (18 mm) above the print station. It is valid only at the beginning of a line.

Hexadecimal	Decimal	ASCII
1A	26	SUB
1B 6D	27 109	ESC m

Generate Tone

Generates an audible tone.

Hexadecimal	Decimal	ASCII
1B 07	27 7	ESC BEL

Set Column

Prints the first character of the next print line in column n. It must be sent for each line not printed at column one. The value of n is set to one after each line. It cannot be used with Single- or Double-Density graphics.

Hexadecimal	Decimal	ASCII	Value of n
1B 14 n	27 20 n	ESC DC4 n	1-44 (Standard Pitch)
			1-56 (Compressed pitch)

Set Character Right-Side Spacing

This command is not implemented and is ignored if received.

Hexadecimal	Decimal	ASCII
1B 20 n	27 32 n	ESC (SPACE) n

Set Absolute Starting Position

Sets the print starting position to the specified number of dots (up to the right margin) from the beginning of the line. The print starting position is reset to the first column after each line.

Hexadecimal	Decimal	ASCII
1B 24 *n*1 *n*2	27 36 *n*1 *n*2	ESC $ *n*1 *n*2

n = Number of dots to be moved from the beginning of the line
*n*1 = Remainder after dividing *n* by 256
*n*2 = Integer after dividing *n* by 256

The values for *n*1 and *n*2 are two bytes in low byte, high byte word orientation.

Determine the value of *n* by multiplying the column for the absolute starting position by 10 (standard pitch) or 8 (compressed pitch). The example shows how to calculate column 29 (10 dots per column) as the absolute starting position.

    28 x 10 = 280 dots (beginning of column 29)
    280/256 = 1, remainder of 24
    *n*1 = 24   *n*2 = 1

Note: This command is also used in the graphics mode to emulate the Epson LQ-950™ dot matrix printer. See "Graphics Commands" later in this chapter for more information.

Note: If the Set Horizontal and Vertical Minimum Motion Units command (1D 50) is used to change the horizontal and vertical minimum motion unit, the parameters of this command (Set Absolute Starting Position) will be interpreted accordingly. For more information, see the description of the Set Horizontal and Vertical Minimum Motion Units command later in this chapter.

Set Line Spacing to 1/6 Inch

Sets the line spacing to 1/6 of an inch (4.25 mm). It is not affected by the Print (17) command.

Hexadecimal	Decimal	ASCII	Default
1B 32	27 50	ESC 2	0.13 Inch (3.33 mm)

Set Line Spacing to *n* Minimum Units

Sets the line spacing to *n*/360 of an inch. The minimum line spacing is 8.5 lines per inch. The line spacing equals the character height when *n* is too small.

Hexadecimal	Decimal	ASCII	Value of *n*	Default
1B 33 *n*	27 51 *n*	ESC 3 *n*	0-255	0.13 Inch (3.33 mm)

Note: If the Set Horizontal and Vertical Minimum Motion Units command (1D 50) is used to change the horizontal and vertical minimum motion unit, the parameters of this command (Set Line Spacing to *n* Minimum Units) will be interpreted accordingly. For more information, see the description of the Set Horizontal and Vertical Minimum Motion Units command later in this chapter.

Select Peripheral Device

Selects the device which the host computer sends data to.

When the printer is disabled by this command, it ignores transmitted data until the printer is re-enabled by the same command.

Hexadecimal	Decimal	ASCII	Value of *n*	Default
1B 3D *n*	27 61 *n*	ESC = *n*	0 (bit 0), device not selected 1 (bit 0), device selected	1

Other bits of *n* are undefined and ignored.

Initialize Printer

Clears the print line buffer and resets the printer to the following default selections (startup configuration):

- Single-Wide, Single-High, Non-Rotated, and Left-Aligned characters are set
- Extra Dot Rows are set to two
- User-defined characters or logo graphics (from RAM) are cleared
- Character Set is set to Code Page 437 (default)
- Character Pitch is reset to 15.2 CPI and column width to 44 (default)
- Returns paper exhaust to the paper status line if an alternate status has been requested (Parallel interface only)

Hexadecimal	Decimal	ASCII
1B 40	27 64	ESC @

Set Horizontal Tab Positions

Sets up to 32 horizontal tab positions in ascending order *n* columns from column one, but does not move the print position. See the Horizontal Tab (09) command. The command ends with hexadecimal 00; hexadecimal 1B 44 00 clears all tabs. The tabs cannot be set higher than the column width of the current pitch: standard pitch = 44 columns; compressed pitch = 56 columns.

Hexadecimal	Decimal	ASCII	Value of *n*	Default
1B 44 *n*1 ... *n*32 00	27 68 *n*1 ... *n*32 00	ESC D *n*1 ... *n*32 00	Column for Tab Minus 1	Every 8 chars. from col. 1 (9, 17, 25, etc.)

Print and Feed *n* Minimum Units

Prints one line from the buffer and feeds the paper *n*/360 inch. The line height equals the character height when *n* is too small.

Hexadecimal	Decimal	ASCII	Value of *n*
1B 4A *n*	27 74 *n*	ESC J *n*	0-255

Note: If the Set Horizontal and Vertical Minimum Motion Units command (1D 50) is used to change the horizontal and vertical minimum motion unit, the parameters of this command (Print and Feed *n* Minimum Units) will be interpreted accordingly. For more information, see the description of the Set Horizontal and Vertical Minimum Motion Units command later in this chapter.

Set Relative Starting Position

Moves the print starting position the specified number of dots either right (up to the right margin) or left (up to the left margin) of the current position.

The print starting position is reset to the first column after each line.

Hexadecimal	Decimal	ASCII	Value of n
1B 5C $n1$ $n2$	27 92 $n1$ $n2$	ESC \ $n1$ $n2$	See Examples Below

To Move the Relative Starting Position Right of the Current Position

n = Number of dots to be moved right of the current position
$n1$ = Remainder after dividing n by 256
$n2$ = Integer after dividing n by 256

The values for $n1$ and $n2$ are two bytes in low byte, high byte word orientation.

Determine the value of n by multiplying the number of columns to move right of the current position by 10 (standard pitch) or 8 (compressed pitch). The example shows how to set the relative position two columns in standard pitch (10 dots per column) to the right of the current position.

2 x 10 = 20 dots (two columns to be moved right of the current position)
20/256 = 0, remainder of 20
$n1$ = 20 $n2$ = 0

To Move the Relative Starting Position Left of the Current Position

n = Number of dots to be moved left of the current position
$n1$ = Remainder after dividing (65,536-n) by 256
$n2$ = Integer after dividing (65,536-n) by 256

The values for $n1$ and $n2$ are two bytes in low byte, high byte word orientation.

Determine the value of n by multiplying the number of columns to move left of the current position by 10 (standard pitch) or 8 (compressed pitch). The example shows how to set the relative position two columns in standard pitch (10 dots per column) to the left of the current position.

2 x 10 = 20 dots (two columns to be moved left of the current position)
65,536-20 = 65516
65,516/256 = 255, remainder of 236
$n1$ = 236 $n2$ = 255

Note: If the Set Horizontal and Vertical Minimum Motion Units command (1D 50) is used to change the horizontal and vertical minimum motion unit, the parameters of this command (Set Relative Starting Position) will be interpreted accordingly. For more information, see the description of the Set Horizontal and Vertical Minimum Motion Units command later in this chapter.

Align Character Positions

Specifies the alignment of characters, graphics, logos, and bar codes (see table). It is valid only at the beginning of a line.

Hexadecimal	Decimal	ASCII	Value of n	Default
1B 61 n	27 97 n	ESC a n	0 (Left Aligned) 1 (Center Aligned) 2 (Right Aligned)	0

Select Sensors to Stop Printing

This command is not implemented and is ignored if received.

Hexadecimal	Decimal	ASCII
1B 63 34 n	27 99 52 n	ESC c 4 n

Enable or Disable Panel Switch)

Toggles the panel switches on and off. Functions that require the panel switches cannot be used when the panel switches are disabled with this command.

Hexadecimal	Decimal	ASCII	Value of n	Default
1B 63 35 n	27 99 53 n	ESC c 5 n	0 = Enable 1 = Disable	0

Print and Feed n Lines

Prints one line from the buffer and feeds paper n lines at the current line height.

Hexadecimal	Decimal	ASCII	Value of n
1B 64 n	27 100 n	ESC d n	1-255 (0 interpreted as 1)

Read from Non-Volatile Memory

Reads a two-byte word from location k in history EEROM. The printer will return the word at the next available opportunity.

This command is not available on Parallel printers.

Hexadecimal	Decimal	ASCII	Value of k
1B 6A k	27 106 k	ESC j k	0-63 (Hex)

Generate Pulse to Open Cash Drawer

Outputs a pulse to open the cash drawer.

The value for either $p1$ or $p2$ is the hexadecimal number multiplied by 2 msec. to equal the total time. The off-time is the delay before the printer performs the next operation.

Hexadecimal	Decimal	ASCII	Value of n	Value of p
1B 70	27 112	ESC p	00 = Drawer 1	$p1$ (Hex) x 2 msec. = On-time
n $p1$ $p2$	n $p1$ $p2$	n $p1$ $p2$	01 = Drawer 2	$p2$ (Hex) x 2 msec. = Off-time

Write to Non-Volatile Memory

Writes two-byte word *n1*:*n2* to location *k* in history EEROM.

Hexadecimal	Decimal	ASCII	Value of *n*	Value of *k*
1B 73	27 115	ESC s	*n1* = 1st Byte	16-63 (Hex Locations
n1 n2 k	*n1 n2 k*	*n1 n2 k*	*n2* = 2nd Byte	00-15 are Reserved)

Set Left Margin

Sets the left margin of the printing area. The command is effective only at the beginning of a line.

Hexadecimal	Decimal	ASCII	Value of *nL*	Value of *nH*
1D 4C *nL nH*	29 76 *nL nH*	GS L *nL nH*	0-255	0-255

The left margin is set to $(((nH \times 256) + nL) \times$ horizontal motion unit) inches. The horizontal motion units are set by the Set Horizontal and Vertical Minimum Motion Units command (1D 50). This command is described below.

The width of the printing area is set by the Set Printing Area Width command (1D 57), which follows the Set Left Margin command. See below for a description of the Set Printing Area Width command.

Notes

If the setting exceeds the printable area, the maximum value of the printable area is used. The maximum printable area is 448 dots. See the illustration.

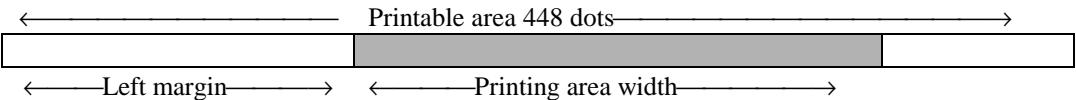The default is the maximum printable area.

Examples

To set the left margin to one inch at the default horizontal motion unit of 1/150 inches, send the four-byte string:

```
GS  L  150  0
```

Or, to set the left margin to two inches at the default horizontal motion unit of 1/150 units per inch, send the four-byte string:

```
GS  L  44  1
```

Where 2 inches = 300/150, and 300 = (1 X 256) + 44.

Set Horizontal and Vertical Minimum Motion Units

Sets the horizontal and vertical motion units to $1/x$ inch and $1/y$ inch respectively.

Hexadecimal	Decimal	ASCII	Value of *x* (Horizontal)	Value of *y* (Vertical)
1D 50 *x y*	29 80 *x y*	GS P *x y*	0-255 Default = 150	0-255 Default = 300

When *x* or *y* is set to 0, the default setting for that motion unit is used.

Notes

The default horizontal motion is *x* = 150. Before this command was implemented on the 7193, the default horizontal motion unit was also *x* = 150, except for graphics. The default for graphics was *x* = 1/300 inch when using the Set Absolute Starting Postion command (1B 24) and Set Relative Starting Position command (1B 5C). The purpose of this was to emulate the Epson LQ-950.

These two commands remain unchanged for existing applications, but their operation is affected if the Set Horizontal and Vertical Minimum Motion Units command is used.

Likewise, before this command was implemented, the default vertical motion unit was *y* = 360, to emulate the Epson TM-T80. That emulation was used for the Set Line Spacing to *n* Minimum Units command (1B 33) and Print and Feed *n* Minimum Units command (1B 4A). These two commands remain unchanged for existing applications, but their operation is affected if the Set Horizontal and Vertical Minimum Motion Units command is used.

Select Cut Mode and Cut Paper

Selects a mode for cutting cutting paper and cuts the paper.

There are two formats for this command, one requiring one parameter *m*, the other requiring two parameters *m* and *n*. The format is indicated by the parameter *m*. If *m* is out of the specified range, this command is ignored.

Hexadecimal	Decimal	ASCII	Value of *m*
1D 56 *m*	29 86 *m*	GS V *m*	0, 1 48, 49

Hexadecimal	Decimal	ASCII	Value of *m*	Value of *n*
1D 56 *m n*	29 86 *m n*	GS V *m n*	65, 66	0-255

The value of *m* selects the mode as shown in the table.

m	Feed and Cut Mode
0, 48	Partial cut (no extra feed).
1, 49	Partial cut (no extra feed).
65	Feeds paper to cutting position + (*n* X vertical motion unit), and cuts the paper partially.
66	Feeds paper to cutting position + (*n* X vertical motion unit), and cuts the paper partially.

Set Printing Area Width

Sets the width of the printing area. The command is effective only at the beginning of a line.

Hexadecimal	Decimal	ASCII	Value of *nL*	Value of *nH*
1D 57 *nL nH*	29 87 *nL nH*	GS W *nL nH*	0-255	0-255

The width of the printing area is set to $(((nH \times 256) + nL) \times$ horizontal motion unit) inches. The horizontal motion units are set by the Set Horizontal and Vertical Minimum Motion Units command (1D 50). This command is described above.

The width of the printing area follows the Set Left Margin command (1D 4C). See above for a description of the Set Left Margin command.

Notes

If the setting exceeds the printable area, the maximum value of the printable area is used. The maximum printable area is 448 dots. See the illustration.

The default is the maximum printable area.

Examples

To set the width of the printing area to one inch at the default horizontal motion unit of 1/150 inches, send the four-byte string:

```
GS  W  150  0
```

Or, to set the width of the printing area to two inches at the default horizontal motion unit of 1/150 units per inch, send the four-byte string:

```
GS  W  44  1
```

Where 2 inches = 300/150, and 300 = (1 X 256) + 44.
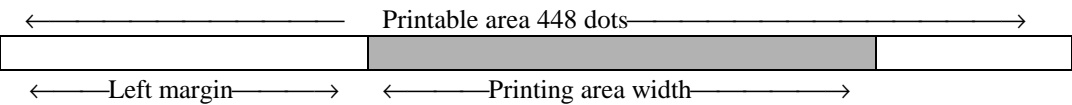
←——————————————————— Printable area 448 dots——————————————————————→

←———Left margin————→   ←————Printing area width—————→

Print Characteristics Commands

These commands control what the printed information looks like: selection of character sets, definition of custom-defined characters, and setting of margins. The commands are described in order of their hexadecimal codes

Select Double-Wide Characters

Prints double-wide characters. The printer is reset to single-wide mode after a line has been printed or a Clear Printer (10) command is received. It may be used with single-wide characters on the same line, but not with Single and Double Density Graphics modes.

Hexadecimal	Decimal	ASCII
12	18	DC2

Select Single-Wide Characters

Prints single-wide characters. It may be used with double-wide characters on the same line, but not with Single and Double Density Graphics modes.

Hexadecimal	Decimal	ASCII
13	19	DC3

Rotate Characters Counter-Clockwise

Rotates characters 90 degrees counter-clockwise. It remains in effect until the printer is reset or until a Clear Printer (10), Set/Cancel Upside-Down Print (1B 7B), or Set/Cancel Rotated Print (1B 56) command is received. It is valid only at the beginning of a line. It cannot be used with non-rotated print on the same line. See "Summary of Rotated Printing" on page 78.

Hexadecimal	Decimal	ASCII
1B 12	27 18	ESC DC2

Select Pitch (Column Width)

Selects the character pitch for a print line. It is valid only at the beginning of a line. Standard and compressed pitches cannot be used together on the same line. See "Appendix B" for a description of both pitches.

Hexadecimal	Decimal	ASCII	Value of n	Default
1B 16 n	27 22 n	ESC SYN n	0 = Standard Pitch 1 = Compressed Pitch	0

Set Print Mode

Selects the print mode: standard, compressed, double high, or double wide. See "Appendix B" for a description of standard and compressed character pitches.

Hexadecimal	Decimal	ASCII	Value of m	Default
1B 21 m	27 33 m	ESC ! m	See Next Table	0

Value of m

Bit	Function	0	1
Bit 0[1]	Pitch	Standard Pitch[2] 44 Col/Line, 15 CPI (Rec) 66 Col/Line, 13.9 CPI (Slip)	Compressed Pitch 56 Col/Line, 19 CPI (Rec) 80 Col/Line, 17.1 CPI (Slip)
Bit 4	Double High[3]	Canceled	Set
Bit 5	Double Wide	Canceled	Set

[1]Bit 0 is ignored unless it is at beginning of line. Bits 1, 2, 3, 6, 7 are not used.

[2]Standard and compressed pitch cannot be used together in the same line.

3Cannot be used together with normal height in same line.

Select Character Set

Selects the character set. The character sets cannot be used together on the same line. When an undefined RAM character is selected, the Code Page 437 character is used. See "Appendix B" for the character sets.

Hexadecimal	Decimal	ASCII	Value of *n*	Default
1B 25 *n*	27 37 *n*	ESC % *n*	0 = Code Page 437 1 = User Defined (RAM) 2 = Code Page 850	0

Define User-Defined Character Set

Defines and enters downloaded characters into RAM. It may be used to overwrite single characters. The user-defined characters are available until power is turned off, the Initialize Printer (1B 40) command is received, or a downloaded bit image (1D 2A) is defined. User-defined characters and a downloaded bit image cannot be used at the same time. The command clears bit image logo data from RAM. Any invalid byte (*s*, *c*1, *c*2, *n*1, *n*2) aborts the command.

Hexadecimal	Decimal	ASCII
1B 26 *s* c*1* c*2* *n*1 *d*1 ... *m*n *d*n	27 38 *s* c*1* c*2* *n*1 *d*1 ... *m*n *d*n	ESC & *s* c*1* c*2* *n*1 *d*1 ... *m*n *d*n

s = 3, the number of bytes (vertically) in the character cell

c = the ASCII codes of the first *(c*1*)* and last *(c*2*)* characters respectively
  *c*1 = Hex 20-FE (20 is always printed as a space)
  *c*2 = Hex 20-FE (20 is always printed as a space)
  To define only one character, use the same code for both *c*1 and *c*2

n = the number of dot columns for the nth character as specified by *n*1 . . . *m*n
  n = 0-10 (standard pitch), 12 and less accepted but ignored
  n = 0-8 (compressed pitch), 12 and less accepted but ignored

d = the column data for the nth character as specified by *d*1 . . . *d*n
  The number of bytes for a character cell is *s* x *n*1
  The bytes are printed down and across each cell

See the illustration.
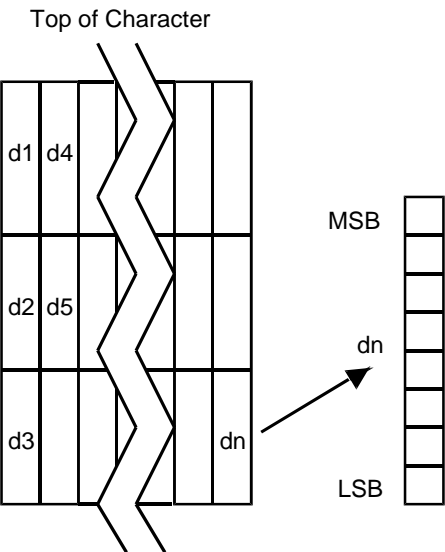
Copy Character Set from ROM to RAM

Copies characters in the active ROM set to RAM. Use it to modify characters in one of the character set variations, such as Rotated Print. Select one of the Rotated Print commands, copy to RAM, then use the command, Define User-Defined Character Set (1B 26).

Hexadecimal	Decimal	ASCII
1B 3A 0 0 0	27 58 0 0 0	ESC : 0 0 0

Cancel User-Defined Character

Cancels the pattern defined for the character code specified by *n*. After the user-defined character is canceled, the corresponding pattern from Code Page 437 is printed.

Hexadecimal	Decimal	ASCII
1B 3F *n*	27 63 *n*	ESC ? *n*

Select Character Code Table

Selects the character set. The character sets cannot be used together on the same line. See "Appendix B" for the character sets.

Hexadecimal	Decimal	ASCII	Value of *n*	Default
1B 52 *n*	27 82 *n*	ESC R *n*	0 = Code Page 437	0
1B 74 *n**	27 116 *n**	ESC t *n**	1 = Code Page 850	

Set or Cancel Rotated Characters Clockwise

Rotates characters 90 degrees clockwise. It remains in effect until the printer is reset or until a Clear Printer (10) or Rotated Print (1B 12) command is received. It is valid only at the beginning of a line. It cannot be used with non-rotated print on the same line. See "Summary of Rotated Printing" on the next page.

Hexadecimal	Decimal	ASCII	Value of *n*	Default
1B 56 *n*	27 86 *n*	ESC V *n*	0 = Cancel	0
			1 = Set	

Set or Cancel Upside-Down Characters

Prints upside-down characters. It is valid only at the beginning of a line. The character order is inverted in the buffer so text is readable. It cannot be used with right-side up characters on the same line. The Rotated Print (1B 12) command cancels this command. Only bit 0 is used. Bits 1-7 are not used. See "Summary of Rotated Printing" on the next page.

Hexadecimal	Decimal	ASCII	Value of *n*	Default
1B 7B *n*	27 123 *n*	ESC { *n*	0 = Cancel	0
			1 = Set	

Summary of Rotated Printing

The table shows the combinations of Set/Cancel Upside-Down Print, Set/Cancel Rotated Print (clockwise), and Rotated Print (counterclockwise). Rotated CCW is mutually exclusive with the other two commands.

The samples of the print show only the normal size characters. Double-wide and double-high characters are printed in the same orientation. They may also be mixed on the same line.

Upside Down 1B 7B *n*	Rotated CW 1B 56 *n*	Rotated CCW 1B 12	Resulting Output
Canceled	Canceled	Cleared	1 (See Below)
Canceled	Set	X	2 (See Below)
Set	Canceled	X	3 (See Below)
Set	Set	X	4 (See Below)
X	X	Set	5 (See Below)

1. ABC   2. ⊢ʊᴖ   3. ƆᗺⱯ   4. ∪ɯ∢   5. ∢ɯ∪

Note: The following print modes cannot be mixed on the same line:

- Standard and compressed pitch
- Vertical (normal) and rotated
- Right-side up and upside down
- Single high (normal) and double high

Graphics Commands

These commands are used to enter and print graphics data and are described in order of their hexadecimal codes:

Set Absolute Starting Position

Sets the print starting position for graphics at the specified number of dots from the beginning of the line as expressed in the following formula: $n = ((n1 + (256 \times n2)) \times 2)$. The resulting dot column must be less than 448. The print starting position is reset to column one after each line.

This command emulates the Epson LQ-950™ dot matrix printer. This allows the 7193 to accept graphics that are normally output from word processing programs to a half-dot matrix printer.

Hexadecimal	Decimal	ASCII
1B 24 *n1 n2*	27 36 *n1 n2*	ESC $ *n1 n2*

n = Number of half dots to be moved from the beginning of the line

Note: The 7193 converts two half-dots to one full dot

n1 = Remainder after dividing *n* by 256

n2 = Integer after dividing *n* by 256

Note: If the Set Horizontal and Vertical Minimum Motion Units command (1D 50) is used to change the horizontal and vertical minimum motion unit, the parameters of this command (Set Absolute Starting Position) will be interpreted accordingly. For more information, see the description of the Set Horizontal and Vertical Minimum Motion Units command earlier in this chapter.

Set Bit Image Mode

Sets the print resolution and enters one line of graphics data into the print buffer. Any print command is required to print the data, after which the printer returns to normal processing mode. See the illustrations for graphic representations of the bit image.

Hexadecimal	Decimal	ASCII
1B 2A m $n1$ $n2$ $d1$ ... dn	27 42 m $n1$ $n2$ $d1$ ... dn	ESC * m $n1$ $n2$ $d1$ ... dn

Value of m	Mode	No. of Dots (Vertical)	No. of Dots (Horizontal)	Number of Dots/LIne
0	8 Dot Single Density	8 (51 DPI)	0-224 (76 DPI)	8 x 224
1	8 Dot Double Density	8 (51 DPI)	0-448 (152 DPI)	8 x 448
32	24 Dot Single Density	24 (152 DPI)	0-224 (76 DPI)	24 x 224
33	24 Dot Double Density	24 (152 DPI)	0-448 (152 DPI)	24 x 448

Value of n (8-Dot Single Density Mode)	Value of n (24-Dot Single Density Mode)	Value of d
$n1 + (256 \times n2)$	$3 \times [n1 + (256 \times n2)]$	Number of Bytes of Data (Printed Down, Then Across)

8-Dot Single-Density Mode

24-Dot Single-Density Mode

Top of Bit Image
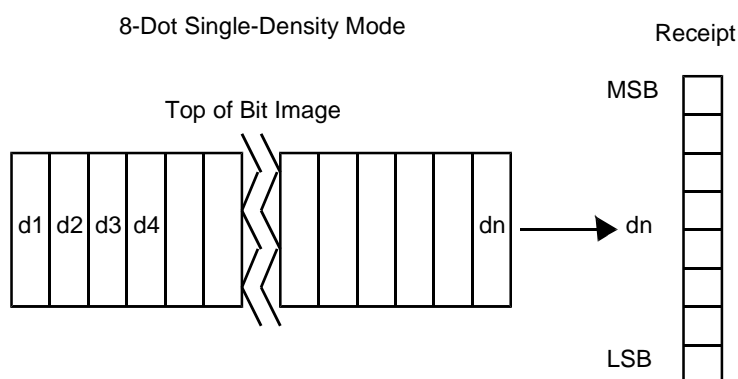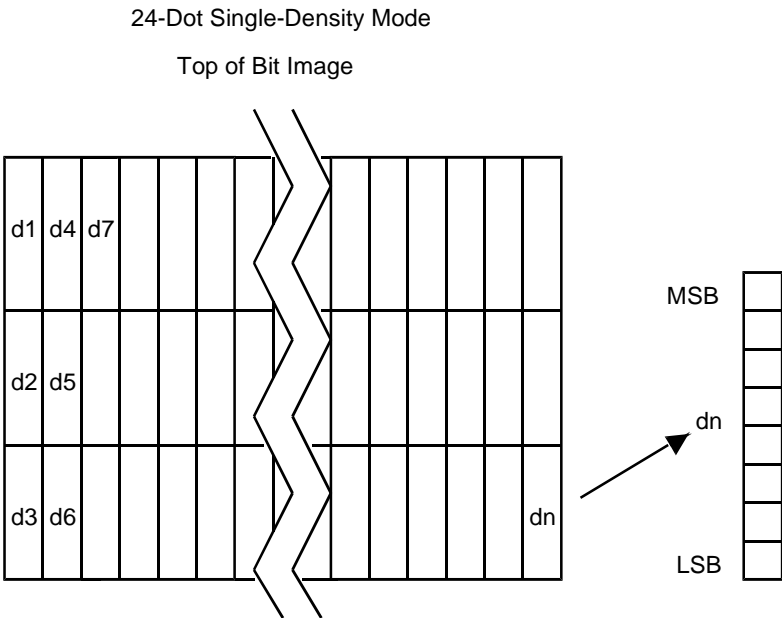
Single-Density Graphics

Enters one line of 8-dot single-density graphics into the print buffer. Any print command is required to print the line, after which the printer returns to normal processing mode. When the print buffer is full, incoming data will be accepted but not printed. Single-density mode allows 0-224 dot columns. The number of bytes sent is represented by the formulas in the second table. Each bit corresponds to two horizontal dots. Compare to Set Bit Image Mode on page 79.

Hexadecimal	Decimal	ASCII
1B 4B $n1$ $n2$ $d1$ ... dn	27 75 $n1$ $n2$ $d1$ ... dn	ESC K $n1$ $n2$ $d1$ ... dn

Value of n (8-Dot Single Density Mode)	Value of n (24-Dot Single Density Mode)	Value of d
$n1 + (256 \times n2)$	$3 \times [n1 + (256 \times n2)]$	Number of Bytes of Data (Printed Down, Then Across)

Double-Density Graphics

Enters one line of 8-dot double-density graphics into the print buffer. Any print command is required to print the line, after which the printer returns to normal processing mode. When the print buffer is full, incoming data will be accepted but not printed. Double-density mode allows 0-448 dot columns. The number of bytes sent is represented by the formulas in the second table. Each bit corresponds to one horizontal dot. Compare to Set Bit Image Mode on page 79.

Hexadecimal	Decimal	ASCII
1B 59 $n1$ $n2$ $d1$ ... dn	27 89 $n1$ $n2$ $d1$ ... dn	ESC Y $n1$ $n2$ $d1$ ... dn
1B 4C $n1$ $n2$ $d1$ ... dn	27 76 $n1$ $n2$ $d1$ ... dn	ESC L $n1$ $n2$ $d1$ ... dn

Value of n (8-Dot Double Density Mode)	Value of n (24-Dot Double Density Mode)	Value of d
$n1 + (256 \times n2)$	$3 \times [n1 + (256 \times n2)]$	Number of Bytes of Data (Printed Down, Then Across)

Define Downloaded Bit Image

Enters a downloaded bit image (such as a logo) into RAM with the number of dots specified by $n1$ and $n2$. It is available until power is turned off, another bit image is defined, or either Initialize Printer (1B 40), or Define User-Defined Character Set (1B 26), command is received.

A downloaded bit image and user-defined characters cannot be defined at the same time. Any user-defined characters will be cleared from RAM when this command is used. See the illustration on the next page for a representation of the bit image.

Hexadecimal	Decimal	ASCII
1D 2A $n1$ $n2$ $d1$ ... dn	29 42 $n1$ $n2$ $d1$ ... dn	GS * $n1$ $n2$ $d1$ ... dn

Value of $n1$	Value of $n2$	Value of d
1-56 (8 x $n1$ = Number of Horizontal Dot Columns)	1-48 (Number of Vertical Bytes)[1]	Bytes of Data (Printed Down, Then Across)

[1]The number of bytes sent is represented by the following formula:
$n = 8 \times n1 \times n2$ ($n1 \times n2$ must be less than or equal to 1344).

Print Downloaded Bit Image

Prints the downloaded bit image in RAM at a density specified by m. It is ignored if any data is available in the print buffer, if the downloaded bit image is undefined, or if the data defined exceeds one line. A downloaded bit image and user-defined characters cannot be used at the same time. See the illustration for a representation of the bit image.

Hexadecimal	Decimal	ASCII	Value of m	Print Mode	Vertical DPI[1]	Horizontal DPI*
1D 2F m	29 47 m	GS / m	0	Normal	152	152
			1	Double Wide	152	76
			2	Double High	76	152
			3	Quadruple	76	76

[1]Dot density measured in dots per inch.
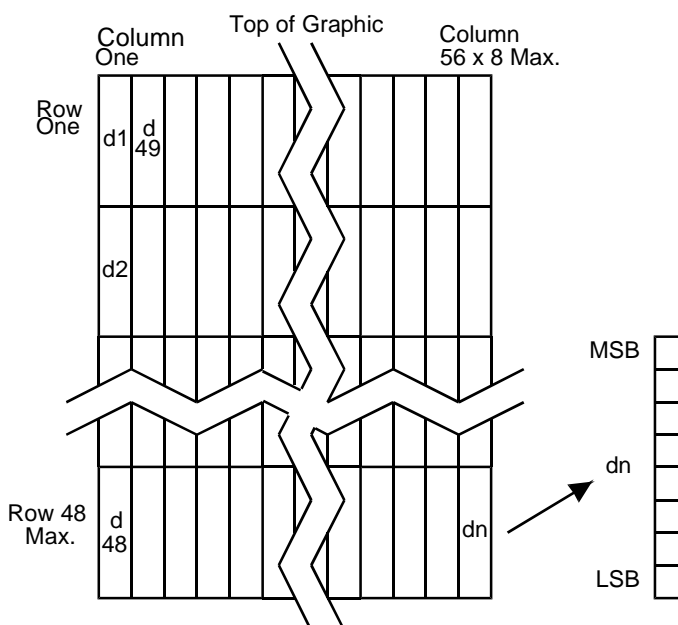
Printer Status Commands

For RS-232C printers, these commands enable the printer to communicate with the host computer following the selected handshaking protocol, either DTR/DSR or XON/XOFF. They are stored in the printer's data buffer as they are received, and are handled by the firmware in the order in which they were received.

When a fault occurs, the printer will go busy at the RS-232C interface and not respond to either of the Printer Status commands. If the fault causing the busy condition can be cleared, such as by loading paper, or letting the thermal printhead cool down, the printer will resume processing the data in its receive buffer.

Printers manufactured after mid 1996 include Real Time commands which are handled when the printer is busy at the RS-232C interface. See the following section, "Real Time Commands," for details about these commands.

Transmit Cash Drawer Status

Transmits current status of the cash drawers. One byte is sent to the host computer. This command is available only on RS-232C printers.

In DTR/DSR protocol the printer waits for DSR = SPACE. If a drawer is not connected, the status will indicate closed.

Hexadecimal	Decimal	ASCII	Bit	1 Signifies	0 Signifies
1B 75 0	27 117 0	ESC u 0	0	Drawer 1 Closed	Drawer 1 Open
			1	Drawer 2 Closed	Drawer 2 Open

Request Alternate Status

This command is available only on Parallel printers. It allows the printer to inform the host when the data in the buffer has been processed, compensating for the lack of bi-directional communication. Status information is limited to what can be sent by the dedicated lines: BUSY, ACK, PAPER EXHAUST, and FAULT.

Hexadecimal	Decimal	ASCII	Value of n
1B 75 n	27 117 n	ESC u n	See Table Below

When this command is sent to the printer, the printer goes "Busy" until all data which has been sent to the printer has been processed. The PAPER EXHAUST line shows the status for the cash drawer or receipt paper as follows:

Value of n	Function	Description
00	Drawer 1	High = Open Low = Closed or Not Present
01	Drawer 2	High = Open Low = Closed or Not Present
02	Paper Low (Not Implemented. Interpreted as Paper Out.)	High = Paper Out Low = Paper Present
03	Paper Out (Default)	High = Paper Out Low = Paper Present
>03	Ignored, No Change	Printer Does Not Stay BUSY[1]

[1]PAPER EXHAUST LINE is valid to indicate previously requested status.

Transmit Printer Status

Sends status data to the host computer.

This command is available only on RS-232C printers.

Hexadecimal	Decimal	ASCII
1B 76	27 118	ESC v

The printer sends one byte to the host computer when it is not busy or in a fault condition. See "Busy Line and Fault Conditions" in the following section, "Real Time Commands," for details about fault condition reporting.

See the table below. In DTR/DSR protocol, the printer waits for DSR = SPACE.

Status Byte (RS-232)

Bit	Function	0 Signifies	1 Signifies
0	Receipt Paper	Present	Out
1	Receipt Cover	Closed	Open
2	Receipt Paper	Present	Out
3	Not Used	Fixed to Zero	Fixed to Zero
4	Not Used	Fixed to Zero	Fixed to Zero
5	Not Used	Fixed to Zero	Fixed to Zero
6	Not Used	Fixed to Zero	Fixed to Zero
7	Not Used	Fixed to Zero	Fixed to Zero

Transmit Printer ID

Transmits the printer ID specified by *n*.

Hexadecimal	Decimal	ASCII	Value of *n*
1D 49 *n*	29 73 *n*	GS I *n*	1-3 49-51

The values of *n* are specified in the following two tables. When *n* is out of the specified range, this command is ignored.

n	Printer ID	Specification	ID (Hexadecimal)
1, 49	Printer model ID	NCR 7193	0x03
2, 50	Type ID	Installed options	refer to next table
3, 51	ROM version ID	ROM version	0x00

Type ID (*n* = 2)

Bit	Off/On	Hex	Decimal	Function
0	Off	00	0	No two-byte character code installed.
	On	01	1	Two-byte character code installed.
1	Off	00	0	No knife installed.
	On	02	2	Knife installed.
2	-	-	-	Undefined.
3	-	-	-	Undefined.
4	Off	00	0	Not used. Fixed to Off.
5	-	-	-	Undefined
6	-	-	-	Undefined
7	Off	00	0	Not used. Fixed to Off.

This command is a batch mode command; that is, the response is transmitted after all prior data in the receive buffer has been processed. There may be a time lag between the printer receiving this command and transmitting the response, depending on the receive buffer status.

Notes

When DTR/DSR RS232C communications handshaking control is selected, the printer transmits the one byte response only when the host signal DSR indicates it is ready to receive data.

When XON/XOFF RS232C communications handshaking control is selected, the printer transmits the one byte response regardless of the host signal DSR.

When Auto Status Back (ASB) is enabled using the Enable/Disable Automatic Status Back command (1D 61), the status transmitted by this command (Transmit Printer ID) and the ASB status must be differentiated according to the information found in "Recognizing Data from the Printer," (in the "Real Time Commands" section later in this chapter).

Enable/Disable Automatic Status Back (ASB)

Enables or disables automatic status back (ASB) and specifies the status items.

This command is a batch mode command; that is, it is processed after all prior data in the receive buffer has been processed. There may be a time lag between the printer receiving this command and changing the ASB response, depending on the receive buffer status.

Hexadecimal	Decimal	ASCII
1D 61 *n*	29 97 *n*	GS a *n*

If *n* = 0, ASB is disabled. The default is *n* = 0 (ASB disabled). The bits of *n* are defined in the table.

Bit	Off/On	Hex	Decimal	Status for ASB
0	Off	00	0	Cash drawer status disabled.
	On	01	1	Cash drawer status enabled.
1	Off	00	0	RS-232C Busy status disabled.
	On	02	2	RS-232C Busy status enabled.
2	Off	00	0	Error status disabled.
	On	04	4	Error status enabled.
3	Off	00	0	Receipt paper roll status disabled.
	On	08	8	Receipt paper roll status enabled.
4	-	-	-	Undefined
5	Off	00	0	Slip detector, slip paper status disabled.
	On	20	32	Slip detector, slip paper status enabled.
6	-	-	-	Undefined
7	-	-	-	Undefined

If any of the status items listed above are selected, ASB is enabled and the printer automatically transmits 4 status bytes whenever the selected status changes. If no status is selected, ASB is disabled. All four status bytes are transmitted without checking DSR.

If the error status is enabled, a change in the following conditions will trigger the ASB:

- Receipt Cover
- Knife Error
- Out-of-Range Printhead Temperature
- Out-of-Range Voltage
- Paper Exhaust

When the printer is disabled by the Select Peripheral Device command (1B 3D), this command (Enable/Disable Automatic Status Back) is disabled but Automatic Status Back is not disabled.

When Auto Status Back (ASB) is enabled using this command, the status transmitted by other commands and the ASB status be differentiated according to the information found in "Recognizing Data from the Printer," (in the "Real Time Commands" section later in this chapter). The status bytes to be transmitted are described in the following four tables.

First Byte (Printer Information)

Bit	Off/On	Hex	Decimal	Status for ASB
0	Off	00	0	Not used. Fixed to off.
1	Off	00	0	Not used. Fixed to off.
2	Off	00	0	One or both cash drawers open.
	On	04	4	Both cash drawers closed.
3	Off	00	0	Not Busy at the RS232C interface.
	On	08	8	Printer is Busy at the RS232C interface.
4	On	10	16	Not used. Fixed to on.
5	Off	00	0	Receipt cover closed.
	On	20	32	Receipt cover open.
6	Off	00	0	Paper feed button is not pressed.
	On	40	64	Paper feed button is pressed.

| 7 | Off | 00 | 0 | Not used. Fixed to off. |

Second Byte (Error information)

Bit	Off/On	Hex	Decimal	Status for ASB
0	-	-	-	Undefined
1	-	-	-	Undefined
2	-	-	-	Undefined
3	Off	00	0	No knife error.
	On	08	8	Knife error occurred.
4	Off	00	0	Not used. Fixed to off.
5	Off	00	0	No unrecoverable error.
	On	20	32	Unrecoverable error occurred.
6	Off	00	0	Thermal printhead temperature and power supply voltage are in range.
	On	40	64	Thermal printhead temperature or power supply voltage is out of range.
7	Off	00	0	Not used. Fixed to off.

Third Byte (Paper Sensor Information)

Bit	Off/On	Hex	Decimal	Status for ASB
0	-	-	-	Undefined
1	-	-	-	Undefined
2	Off	00	0	Receipt paper present.
	On	04	4	Receipt paper exhausted.
3	-	-	-	Undefined
4	Off	00	0	Not used. Fixed to off.
5	-	-	-	Undefined
6	-	-	-	Undefined
7	Off	00	0	Not used. Fixed to off.

Fourth Byte (Paper Sensor Information)

Bit	Off/On	Hex	Decimal	Status for ASB
0	-	-	-	Undefined
1	-	-	-	Undefined
2	-	-	-	Undefined
3	-	-	-	Undefined
4	Off	00	0	Not used. Fixed to off.
5	-	-	-	Undefined
6	-	-	-	Undefined
7	Off	00	0	Not used. Fixed to off.

Transmit Status

Transmits the status specified by *n*.

This command is a batch mode command; that is, the response is transmitted after all prior data in the receive buffer has been processed. There may be a time lag between the printer receiving this command and transmitting the response, depending on the receive buffer status.

Hexadecimal	Decimal	ASCII	Value of *n*
1D 72 *n*	29 114 *n*	GS r *n*	1, 2
			49, 50

When *n* is out of the specified range, this command is ignored. The bits of *n* are defined in the table.

n	Function
1, 49	Printer Status
2, 50	Cash Drawer Status

Notes

When DTR/DSR RS232C communications handshaking control is selected, the printer transmits the one byte response only when the host signal DSR indicates it is ready to receive data.

When XON/XOFF RS232C communications handshaking control is selected, the printer transmits the one byte response regardless of the host signal DSR.

When Auto Status Back (ASB) is enabled using the Enable/Disable Automatic Status Back command (1D 61), the status transmitted by this command (Transmit Status) and the ASB status must be differentiated according to the information found in "Recognizing Data from the Printer," (in the "Real Time Commands" section later in this chapter).

The status bytes to be transmitted are described in the following two tables.

Printer Status (*n* = 1 or *n* = 49)

Bit	Off/On	Hex	Decimal	Status for Transmit Status
0	Off	00	0	Receipt paper present.
	On	01	1	Receipt paper exhausted.
1	Off	00	0	Receipt cover closed.
	On	02	2	Receipt cover open.
2	Off	00	0	Receipt paper present.
	On	04	4	Receipt paper exhausted.
3	-	-	-	Undefined
4	Off	00	0	Not used. Fixed to off.
5	-	-	-	Undefined
6	-	-	-	Undefined
7	Off	00	0	Not used. Fixed to off.

Cash Drawer Status (*n* = 2 or *n* = 50)

Bit	Off/On	Hex	Decimal	Status for Transmit Status
0	Off	00	0	One or both cash drawers open.
	On	01	1	Both cash drawers closed.
1	Off	00	0	One or both cash drawers open.
	On	02	2	Both cash drawers closed.
2	-	-	-	Undefined
3	-	-	-	Undefined
4	Off	00	0	Not used. Fixed to off.
5	-	-	-	Undefined
6	-	-	-	Undefined
7	Off	00	0	Not used. Fixed to off.

Real Time Commands

The Real Time commands provide an application interface to the printer even when the printer is not handling other commands (RS-232C communication interface only):

- Real Time Status Transmission: GS (Hex 1D) Sequence and DLE (Hex 10) Sequence
- Real Time Request to Printer: GS (Hex 1D) Sequence and DLE (Hex 10) Sequence
- Real Time Printer Status Transmission

The original Printer Status commands, **Transmit Printer Status (Hex 1B 76, ASCII ESC v)** and **Transmit Cash Drawer Status (Hex 1B 75 0, ASCII ESC u 0)** are placed in the printer's data buffer as they are received and handled by the firmware in the order in which they were received. If the paper exhausts while printing data which was in the buffer ahead of the status command, the printer goes busy at the RS-232C interface and suspends processing the data in the buffer until paper is reloaded. This is true for all error conditions: knife home error, thermal printhead overheat, etc. In addition, there is no way to restart the printer after a paper jam or other error.

The Real Time commands are implemented in two ways to correct these problems. Both implementations offer the same functionality; which one you choose depends on the current usage of your application.

First Implementation

For a new application the GS (Hex 1D) sequences of the first implementation are recommended to avoid possible misinterpretation of a DLE (Hex 10) sequence as a **Clear Printer (Hex 10 0, ASCII DLE NUL)** command.

The first implementation builds upon the GS ENQ sequence as implemented on Epson's TM-930II™, TM-950™ and TM-U950™ by defining two new GS (Hex 1D) sequences to provide the same functions as the DLE (Hex 10) sequences above, and to provide complete backward compatibility to the original 7193 Clear Printer command.

An application using these GS (Hex 1D) sequences does not need to distinguish for the printer between the new Real Time commands and the old Clear Printer command. This implementation is ideal for an existing 7193 application which already uses the Clear Printer command or for a new application being developed.

This implementation also provides the original GS ENQ Real Time sequence in addition to the newer Real Time sequences.

Alternate Implementation

The alternate implementation uses the DLE (Hex 10) sequences as implemented on Epson's TM-T85™ and TM-U950™. An application using these DLE (Hex 10) sequences and the original 7193 Clear Printer command must distinguish for the printer between the new Real Time commands and the old Clear Printer command by adding a NUL (Hex 00) to the Clear Printer command.

An application using these DLE (Hex 10) sequences must also send the second byte of the sequence within 100 milliseconds of the first, to prevent the first byte being mistaken for a Clear Printer command. This implementation is useful for an existing TM-T85™ or TM-U950™ application which is being migrated to a 7193. This application would not be using the 7193 Clear Printer command at all since it is not recognized by the Epson printers.

Note: The DLE (Hex 10) sequences as implemented on Epson's TM-T85™ and TM-U950™ are not exactly the same as those implemented on Epson's TM-950™.

This implementation also provides the original GS ENQ Real Time sequence in addition to the newer Real Time sequences.

Rules for Using Real Time Commands

Three situations must be understood when using Real Time commands.

1. First, the printer executes the Real Time command upon receiving it and will transmit status regardless of the condition of the DSR signal.

2. Second, the printer transmits status whenever it recognizes a Real Time status transmission command sequence, even if that sequence happens to occur naturally within the data of another command, such as graphics data.

    In this case the sequence will also be handled correctly as the graphics data it is intended to be, when the graphics command is executed from the buffer.

3. Care must be taken not to insert a Real Time command into the data sequence of another command that consists of two or more bytes.

    In this case the printer will use the Real Time command sequence bytes instead of the other command's parameter bytes when finally executing that other command from the buffer; the other command will NOT be executed correctly.

These three situations generally preclude use of standard DOS drivers for the serial communication ports when using Real Time commands.

Moving Data Through the Buffer

Applications should not let the buffer fill up with Real Time commands when the printer is busy at the RS-232C interface. A busy condition at the RS-232C interface can be determined by bit 3 of the response to GS ENQ or GS EOT 1 or DLE EOT 1. The reason for a particular busy condition can be determined by other responses to GS EOT n or DLE EOT n.

Although the printer responds to Real Time commands when it is busy, it will place them into the buffer behind any other data there, and flush them out in the order in which they were received. When the printer is busy due simply to buffer full (that is, it can't print data as fast as it can receive it), then data continues to be processed out of the buffer at approximately print speed and the Real Time commands will eventually get flushed out.

When the printer is busy due to an error condition, then data stops being processed of the buffer until the condition clears one way or another. In either case, but more quickly in the case of an error condition, the buffer can fill with Real Time commands.

When the DLE sequences are being used, the last byte stored when the buffer fills up could be the DLE code, with no room for the subsequent EOT or ENQ. When this lone DLE byte is finally processed out of the buffer it will be interpreted as a Clear Printer command.

Similarly, when the GS sequences are being used, the last byte stored when the buffer fills up could be the GS code, with no room for the subsequent EOT or ETX or ENQ. When this lone GS byte is finally processed out of the buffer it will use the next byte, whatever it is, as the second byte in its GS sequence.

To guard against this situation, the application must determine the cause of a busy condition and take appropriate action or pace the Real Time commands to avoid filling the buffer. There are a minimum of 256 bytes available in the printer's buffer when it goes busy.

Busy Line and Fault Conditions

An additional improvement is made in the way the 7193 RS-232C handles the busy line (or busy condition when using XON/XOFF) during a fault condition.

Before this improvement, the printer would go busy at the RS-232C interface when the receipt door was opened or the paper was exhausted as soon as it received the next input byte. Bytes would continue to be accepted until the buffer was full or the condition was cleared, but would stop processing data out of the receive buffer. This resulted in the printer being unable to respond to the batch mode status commands (ESC v and ESC u), or handle the cash drawer commands even when it was not printing.

The improvement overcomes this limitation by not going busy at the RS-232C interface until it attempts to process a command out of the receive buffer which it can't do: for example, print on the receipt when it's out of paper. It will stay busy and stop processing data out of the receive buffer until the condition clears.

Now if the cover is open or the paper is exhausted, the 7193 printer will still accept data, respond to the batch mode status commands (ESC v and ESC u), handle the cash drawer commands, and not go busy until it actually tries to execute a print command. Then it will stay busy and stop processing data out of the receive buffer until the condition clears. It will respond to the Real Time commands as described below.

The only potential backward compatibility issue is if some application expects the 7193 to go busy when it processes a batch mode status command, which it now won't. To handle this case, there is now a parameter setup in NVRAM to have the printer handle the busy line the old way. The default will be the new way, but the printer can be programmed in the field if it proves to be a problem.

To program the printer to handle the busy line the old way do the following steps:

1. Record the current switch settings for their RS-232C parameters.

2. Set switches 2 and 3 to OFF, and set switches 1, 4, 5, and 6 to ON.

3. Power cycle the printer.

4. Wait until the printer beeps to store the parameter change in NVRAM.

5. Restore the switches to their RS-232C parameters.

6. Power cycle the printer.

7. Print out the diagnostics to be sure that the busy line parameter changed.

If you have programmed the printer to handle the busy line the old way, but wish to re-program it to the new way, do the following steps:

1. Record the current switch settings for their RS-232C parameters.

2. Set switches 2, 3, and 6 to OFF, and set switches 1, 4, and 5 to ON.

3. Power cycle the printer.

4. Wait until the printer beeps to store the parameter change in NVRAM.

5. Restore the switches to their RS-232C parameters.

6. Power cycle the printer.

7. Print out the diagnostics to be sure that the busy line parameter changed.

Real Time Status Transmission

Transmits the selected one byte printer status specified by *n* in Real Time according to the following parameters.

GS Sequence

Hexadecimal	Decimal	ASCII	Value of *n*
1D 04 *n*	29 4 *n*	GS EOT *n*	1 = Transmit printer status 2 = Transmit RS-232C busy status 3 = Transmit error status 4 = Transmit receipt paper status

The command is ignored if *n* is out of range.

DLE Sequence

Hexadecimal	Decimal	ASCII	Value of *n*
10 04 *n*	16 4 *n*	DLE EOT *n*	1 = Transmit printer status 2 = Transmit RS-232C busy status 3 = Transmit error status 4 = Transmit receipt paper status 5 = Transmit slip paper status

The command is ignored if *n* is out of range.

Note: An application using the DLE sequence must send EOT within 100 milliseconds of DLE or the printer will misinterpret the DLE and execute a Clear Printer command. Avoid this possibility by using the GS EOT n sequence which is handled exactly the same as DLE EOT n.

1 = Transmit Printer Status

Bit	Status	Hex	Decimal	Function
0	Off	00	0	Fixed to Off.
1	On	02	2	Fixed to On.
2	Off	00	0	One or both cash drawers open.
	On	04	4	Both cash drawers closed.
3	Off	00	0	Not busy at the RS-232C interface.
	On	08	8	Printer is Busy at the RS-232C interface.
4	On	10	16	Fixed to On.
5				Undefined.
6				Undefined.

7	Off	00	0	Fixed to On.

2 = Transmit RS-232C Busy Status

Bit	Status	Hex	Decimal	Function
0	Off	00	0	Fixed to Off.
1	On	02	2	Fixed to On.
2	Off	00	0	Both receipt and cassette doors closed.
	On	04	4	Receipt or cassette door open.
3	Off	00	0	Paper feed button is not pressed.
	On	08	8	Paper feed button is pressed.
4	On	10	16	Fixed to On.
5	Off	00	0	Printing not stopped due to paper condition.
	On	20	32	Printing stopped due to paper condition.
6	Off	00	0	No error condition.
	On	40	64	Error condition exists in the printer.
7	Off	00	0	Fixed to Off.

3 = Transmit Error Status

Bit	Status	Hex	Decimal	Function
0	Off	00	0	Fixed to Off.
1	On	02	2	Fixed to On.
2	Off	00	0	No slip motor jam.
	On	04	4	Slip motor jam occurred.
3	Off	00	0	No knife error.
	On	08	8	Knife error occurred.
4	On	10	16	Fixed to On.
5	Off	00	0	No unrecoverable error.
	On	20	32	Unrecoverable error occurred.
6	Off	00	0	Thermal printhead temp. and power supply voltage are in range.
	On	40	64	Thermal printhead temp. and power supply voltage are out of range.
7	Off	00	0	Fixed to Off

4 = Transmit Receipt Paper Status

Bit	Status	Hex	Decimal	Function
0	Off	00	0	Fixed to Off
1	On	02	2	Fixed to On
2	Off	00	0	Receipt paper adequate
	On	04	4	Receipt paper low
3	Off	00	0	Receipt paper adequate
	On	08	8	Receipt paper low
4	On	10	16	Fixed to On
5	Off	00	0	Receipt paper present
	On	20	32	Receipt paper exhausted
6	Off	00	0	Receipt paper present

	On	40	64	Receipt paper exhausted
7	Off	00	0	Fixed to Off

Real Time Request to Printer

The printer responds to a request from the host specified by *n*. The operations performed depend on the value of *n*, according to the following parameters.

GS Sequence

Hexadecimal	Decimal	ASCII	Value of *n*
1D 03 *n*	29 3 *n*	GS ETX *n*	1 = Recover and restart 2 = Recover and clear buffers

The command is ignored if *n* is out of range.

DLE Sequence

Hexadecimal	Decimal	ASCII	Value of *n*
10 05 *n*	16 5 *n*	DLE ENQ *n*	1 = Recover and restart 2 = Recover and clear buffers

The command is ignored if *n* is out of range.

Note: An application using the DLE sequence must send ENQ within 100 milliseconds of DLE or the printer will misinterpret the DLE and execute a Clear Printer command. Avoid this possibility by using the GS ETX n sequence which is handled exactly the same as DLE ENQ n.

n = 1

Restarts printing from the beginning of the line where an error occurred, after recovering from the error. Print settings that are normally preserved from line to line, such as character height and width, are still preserved with this command. This sequence is ignored except when the printer is busy due to an error condition.

If the receipt is selected, this command will attempt recovery from a knife error. Other errors associated with the receipt, such as paper out or printhead overheating, can be recovered from only by clearing the specific condition, such as loading paper or letting the printhead cool down.

n = 2

Recovers from an error after clearing the receive and print buffers. Print settings that are normally preserved from line to line, such as character height and width, are still preserved with this command. This sequence is ignored except when the printer is busy due to an error condition.

The same error recovery possibilities exist as for *n* = 1.

Real Time Printer Status Transmission

Transmits one byte status of the printer in real time.

Hexadecimal	Decimal	ASCII
1D 05	29 5	GS ENQ

Bit	Status	Hex	Decimal	Function
0	Off	00	0	Receipt paper adequate.
	On	01	1	Receipt paper low.
1	Off	00	0	Receipt paper adequate.
	On	02	2	Receipt paper low.
2	Off	00	0	Both receipt and cassette doors closed.
	On	04	4	Receipt or cassette door open.
3	Off	00	0	Not busy at the RS-232C interface.
	On	08	8	Printer is busy at the RS-232C interface.
4	Off	00	0	One or both cash drawers open.
	On	10	16	Both cash drawers closed.
5	Off	00	0	Paper present at both slip sensors.
	On	20	32	Paper not present at one or both slip sensors.
6	Off	00	0	No error condition.
	On	40	64	Error condition exists in the printer.
7	On	80	128	Fixed to On.

7193 Clear Printer Command

Resets certain parameters and clears the print buffer as originally defined. This is NOT a Real Time command. It only distinguishes the Clear Printer command from other DLE sequences.

Hexadecimal	Decimal	ASCII
10 00	16 0	DLE NUL

Recognizing Data from the Printer

An application sending various Real Time and non-Real Time commands to which the printer responds can determine which command a response belongs to by the following table. Responses to ESC u and ESC v are non-Real Time responses and will arrive in the order in which they were solicited.

Although the original intent of the response to ESC v was to provide error information in its one-byte response, the response up to now has always been Hex 00 when transmitted. This is because ESC v was not processed until the error condition was cleared. With the improvement to the busy line handling described earlier in this section, ESC v will be processed as long as there is no paper out or cover open error condition.

Batch Mode Response	Response Recognized By:								
ESC u 0	0	0	0	0	0	0	x	x	Binary
ESC v	0	0	0	0	0	x	x	x	Binary
GS I *n*	0	x	x	0	x	x	x	x	Binary
GS r *n*	0	x	x	0	x	x	x	x	Binary

Real Time Response	Response Recognized By:								
GS EOT *n*	0	x	x	1	x	x	1	0	Binary
DLE EOT *n*	0	x	x	1	x	x	1	0	Binary
GS ENQ	1	x	x	x	x	x	x	x	Binary
XON	0	0	0	1	0	0	0	1	Binary
XOFF	0	0	0	1	0	0	1	1	Binary

Auto Status Back (ASB)	Response Recognized By:								
ASB Byte 1	0	x	x	1	x	x	0	0	Binary
ASB Bytes 2-4	0	x	x	0	x	x	x	x	Binary

Bar Code Commands

These commands format and print bar codes and are described in order of their hexadecimal codes.

Select Printing Position of HRI Characters

Prints HRI characters (Human Readable Interface) above or below the bar code.

Hexadecimal	Decimal	ASCII	Value of *n* (Printing Position)	Default
1D 48 *n*	29 72 *n*	GS H *n*	0 = Not Printed 1 = Above the Bar Code 2 = Below the Bar Code 3 = Both Above and Below the Bar Code	0

Select Pitch of HRI Characters

This command is not implemented and is ignored if received.

Hexadecimal	Decimal	ASCII	Value of *n* (Pitch)	Default
1D 66 *n*	29 102 *n*	GS f *n*	0 = Standard Pitch at CPI 1 = Compressed Pitch at 19 CPI	0

Select Height of Bar Code

Sets the bar code height to *n* dots or *n*/152 inch (*n*/6 mm).

Hexadecimal	Decimal	ASCII	Value of *n*	Default
1D 68 *n*	29 104 *n*	GS H *n*	1-255	162

Print Bar Code

Selects the bar code type and prints a bar code for the ASCII characters entered. The command is only valid at the beginning of a line. If the width of the bar code exceeds one line, the excess data is not printed. Illegal data cancels the command.

There are two variations to this command: the first uses a NULL character to terminate the string; the second uses a length byte at the beginning of the string to compensate for the Code 128 bar code which can accept a NULL character as part of the data.

Note: Fixed-length codes can be aligned left, center, or right using the Align Positions (1B 61) command. Variable-length codes are always center aligned.

The check digit is calculated for UPC and JAN (EAN) codes if it is not sent from the host computer. Six-character zero-suppressed UPC-E tags are generated from full 11 or 12 characters sent from the host computer according to standard UPC-E rules. Start/Stop characters are added for Code 39 if they are not included.

First Variation: String terminated with NULL Character

Hexadecimal	Decimal	ASCII
1D 6B *m [d]n* 00	29 107 *m [d]n* 0	GS k *m [d]n* NUL

0 = End of command.

m = 0-6 (see the table)
d = 32-126 (see the table)
n = 1-255 (see the table)

m	Bar Code	*d*	*n*, Length
0	UPC-A	48- 57 (ASCII numerals)	Fixed Length: 11, 12
1	UPC-E	48- 57	Fixed Length: 11, 12
2	JAN13 (EAN)	48- 57	Fixed Length: 12, 13
3	JAN8 (EAN)	48- 57	Fixed Length: 7,8
4	Code 39	48- 57, 65- 90 (ASCII alphabet), 32, 36, 37, 43, 45, 46, 47 (ASCII special characters) $d1 = dk = 42$ (start/stop code is supplied by printer if necessary)	Variable Length
5	Interleaved 2 of 5	48- 57	Variable Length (Even Number)
6	Codabar	65- 68, start code 48- 57, 36, 43, 45, 46, 47, 58	Variable Length

Second Variation: Length of Byte Specified at Beginning of String

Hexadecimal	Decimal	ASCII
1D 6B *m [d]n*	29 107 *m [d]n*	GS k *m [d]n*

m = 65-71, 73 (see the table)

d =0-127 (see the table)

n = 1-255 (see the table)

The value of *m* selects the bar code system as described in the table. When data is present in the print buffer, the printer processes the data following *m* as normal data.

The variable *d* indicates the character code to be encoded into the specified bar code system. See the table. If character code *d* cannot be encoded, the printer prints the bar code data processed so far, and the following data is treated as normal data.

m	Bar Code	*d*	*n,* Length
65	UPC-A	48- 57 (ASCII numerals)	Fixed Length: 11, 12
66	UPC-E	48- 57	Fixed Length: 11, 12
67	JAN13 (EAN)	48- 57	Fixed Length: 12, 13
68	JAN8 (EAN)	48- 57	Fixed Length: 7, 8
69	CODE39	48- 57, 65- 90 (ASCII alphabet), 32, 36, 37, 43, 45, 46, 47 (ASCII special characters) *d1* = *dk* = 42 (start/stop code is supplied by printer if necessary)	Variable
70	Interleaved 2 of 5 (ITF)	48- 57	Variable (Even Number)
71	CODABAR (NW-7)	65- 68, start code 48- 57, 36, 43, 45, 46, 47, 58	Variable
73	Code 128*	0-105 *d1* = 103-105 (must be a Start code) *d2* = 0-102 (data bytes) (Stop code is provided by the printer)	Variable

Select Width of Bar Code

Sets the bar code width to *n* dots or *n*/152 inch (*n*/6 mm).

Hexadecimal	Decimal	ASCII	Value of *n*	Default
1D 77 *n*	29 119 *n*	GS w *n*	2, 3, 4	3

Appendix A: Specifications

Features

Interfaces:	RS-232C, Parallel
Memory/Firmware:	16K RAM (available for downloadable character sets and bit-mapped graphics)
	History EEROM
	4K Buffer
Resident character sets:	PC Code Page 437 (US)
	PC Code Page 850 (Multilingual)
Integrated bar codes:	Code 39, Code 128, UPC-A, UPC-E, JAN8 (EAN), JAN13 (EAN), Interleaved 2 of 5, Codabar
Options:	Knife
	Power Supply (separate in-line power supply for models not receiving power from host)
	Wall-Mount Kit
	Cash Drawer Drivers
	Communication Cable

Reliability

Thermal Mechanism:	36 Million Lines
Electronics:	240,000 Hours of Ontime
Knife:	1 Million Cuts

Power Requirements

The 7193 printer receives power from a separate in-line power supply which can be purchased separately.

Power from Power Supply (Remote)	
Voltage:	24 Vdc
	+5 Volt Supply for the Logic Circuits

Environmental Conditions

Operating Temperature:	5°C to 35°C (40°F to 95°F), models with no knife
	5°C to 28°C (41°F to 82°F), models with knife
Operating Humidity:	5% to 90%

Note: The printer can operate at higher temperatures if the humidity is lower (5°C to 45°C with humidity of 5% to 35%).

Condensation:	Condensation may occur when the printer is moved from cold to warm areas after shipment. The printer's design permits operation after drying out and stabilizing at room temperature.

Dimensions and Weight

Height:	119 mm (4.69 in.)
Height with Cover Open:	225 mm (8.85 in.)
Width:	165 mm (6.5 in.)
Depth:	187 mm (7.35 in.)
Weight:	1.3 kg (2.9 lb.)

Printing Specifications

Speed:	1020 Lines per Minute
Noise Level:	50 dBA (ISO 7779)
Printhead:	Direct Thermal, Fixed Head
Print Area:	Host Selectable 44 (Standard) or 56 (Compressed) Columns
Character Pitch:	15.2 Characters per Inch (Standard)
	19.0 Characters per Inch (Compressed)
Dot Density:	152 Dots per Inch
Line Spacing:	7.6 Lines per Inch
Character Cell:	10 x 18 Dots (Standard)
	8 x 18 Dots (Compressed)
Print Modes:	Standard, Compressed, Double High, Double Wide, Upside Down, Rotated
Paper Diameter:	83 mm Maximum (3.27 Inches)
Paper Length:	83 Meters (273 ft.)
Paper Width:	80 mm ± .2 mm
	(3.15 Inches ± .02 inches)

Print Zones

The printer centers characters (standard pitch and compressed pitch) and graphics on an 80 mm wide (3.15 in.) receipt.

- Standard pitch: 10 x 18 dots in character cell, 44 characters (columns) per line
- Compressed pitch: 8 x 18 dots in character cell, 56 characters (columns) per line
- Graphics: 448 addressable bits

The minimum print line height is 18 dots for characters and 24 dots for graphics. The standard print line height is 20 dots (3.33 mm, .131 in.) for characters (with two extra dot rows).

```
←————— Paper Width = 80 mm (3.15 in.) —————→

        Top Margin, 18 mm (.71 in.) Minimum

        ←——— Print Zone, 74.7 mm (2.94 in.) ———→
                        448 Dots
→   ←—— Left and Right Margins, 2.65 mm (.105 in.) ——→   ←
```
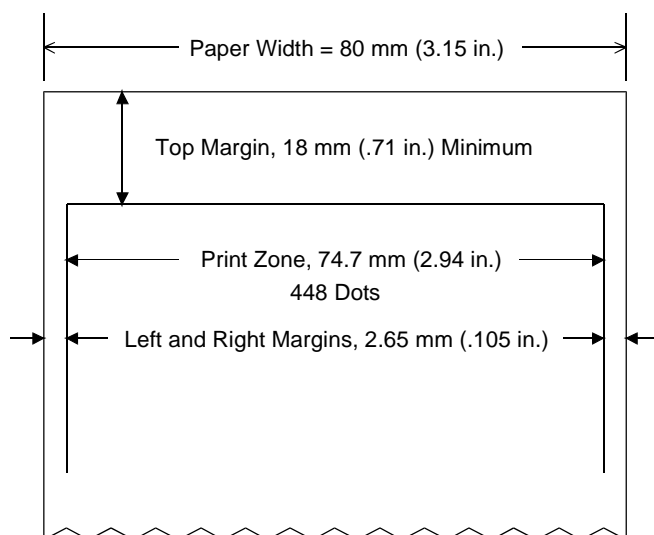
Density of Receipt Print Lines

When the 7193 prints high density print lines (text or graphics), it automatically slows down to a rate slower than 1020 lines per minute. High density print lines are defined as lines with over 57% of the dots printing on the line (there are 448 total dot columns on the print station).

Duty Cycle Restrictions (Printing Solid Blocks)

There are restrictions on the duty cycle because of the heat generated by the receipt thermal printhead when printing solid blocks (regardless of the length of the block in relation to the print line). The restrictions are ambient temperature, the percentage of time (measured against one minute) of continuous solid printing, and the amount of coverage.

Caution: When the duty cycle approches the limits shown in the table, the receipt printhead will heat up and shut down. This may damage the printhead.

To avoid this problem, do one or a combination of the following:

1. Reduce the amount of coverage.

2. Reduce the time of continuous solid printing.

3. Reduce the ambient temperature.

	Ambient Temperature		
Amount of Solid Coverage	25° C	35° C	50° C
20%	100% of 1 min. continuous printing	50% of 1 min. continuous printing	20% of 1 min. continuous printing
40%	50% of 1 min. continuous printing	25% of 1 min. continuous printing	10% of 1 min. continuous printing
100%	20% of 1 min. continuous printing	10% of 1 min. continuous printing	3% of 1 min. continuous printing

Appendix B: Print Characteristics

Character Size

The following two illustrations show the dot patterns of sample characters for standard pitch (15.2 CPI) and compressed pitch (19 CPI).

B - Upper Case   Ö - With Ascender
m - Lower Case $ - Both Ascender and Desender
g - With Descender   ‡ - Graphic Synbol
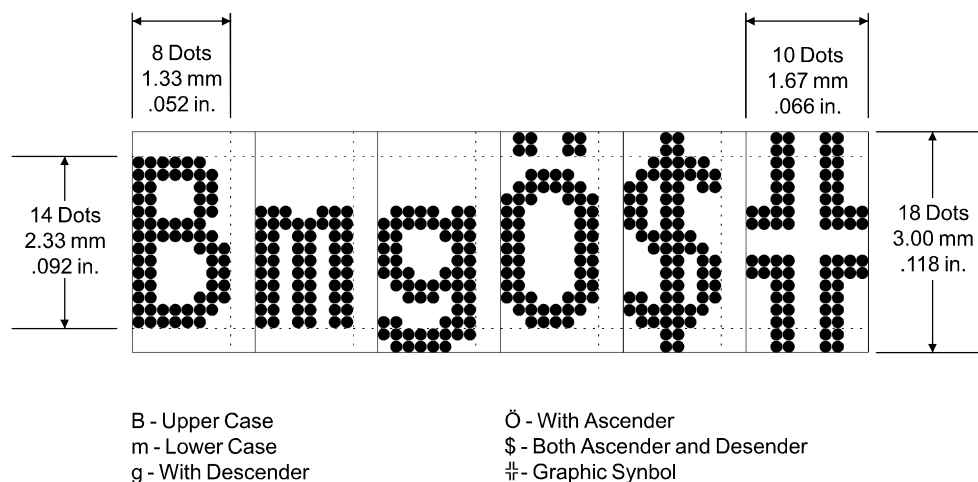
152 DPI, 15.2 CPI Pitch (Standard)

B - Upper Case   Ö - With Ascender
m - Lower Case $ - Both Ascender and Desender
g - With Descender   ‡ - Graphic Synbol
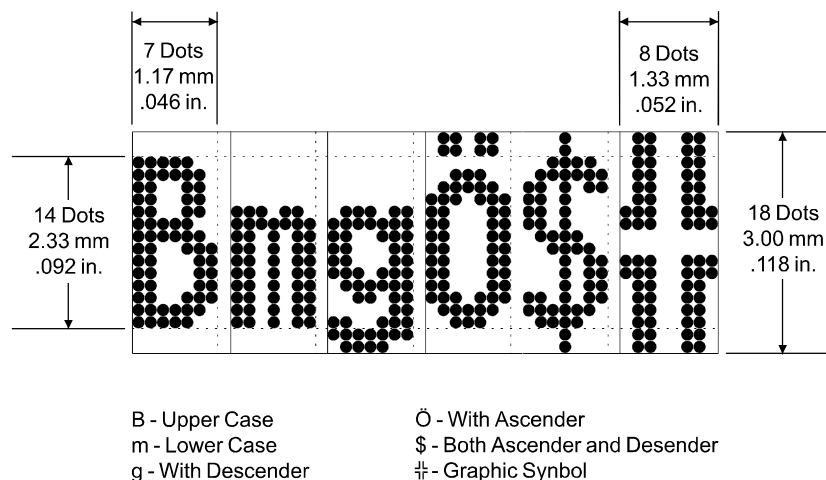
152 DPI, 19 CPI Pitch (Compressed)

Code Page 437 Character Set

These are the characters for the Code Page 437 character set.

00	10	20 SP	30 0	40 @	50 P	60 `	70 p	80 Ç	90 É	A0 á	B0 ░	C0 └	D0 ╨	E0 ∝	F0 ≡
0	16	32	48	64	80	96	112	128	144	160	176	192	208	224	240
01	11	21 !	31 1	41 A	51 Q	61 a	71 q	81 ü	91 æ	A1 í	B1 ▒	C1 ┴	D1 ╤	E1 β	F1 ±
1	17	33	49	65	81	97	113	129	145	161	177	193	209	225	241
02	12	22 "	32 2	42 B	52 R	62 b	72 r	82 é	92 Æ	A2 ó	B2 ▓	C2 ┬	D2 ╥	E2 Γ	F2 ≥
2	18	34	50	66	82	98	114	130	146	162	178	194	210	226	242
03	13	23 #	33 3	43 C	53 S	63 c	73 s	83 â	93 ô	A3 ú	B3 │	C3 ├	D3 ╙	E3 π	F3 ≤
3	19	35	51	67	83	99	115	131	147	163	179	195	211	227	243
04	14	24 $	34 4	44 D	54 T	64 d	74 t	84 ä	94 ö	A4 ñ	B4 ┤	C4 ─	D4 ╘	E4 Σ	F4 ⌠
4	20	36	52	68	84	100	116	132	148	164	180	196	212	228	244
05	15	25 %	35 5	45 E	55 U	65 e	75 u	85 à	95 ò	A5 Ñ	B5 ╡	C5 ┼	D5 ╒	E5 σ	F5 ⌡
5	21	37	53	69	85	101	117	133	149	165	181	197	213	229	245
06	16	26 &	36 6	46 F	56 V	66 f	76 v	86 å	96 û	A6 ª	B6 ╢	C6 ╞	D6 ╓	E6 µ	F6 ÷
6	22	38	54	70	86	103	118	134	150	166	182	198	214	230	246
07	17	27 '	37 7	47 G	57 W	67 g	77 w	87 ç	97 ù	A7 º	B7 ╖	C7 ╟	D7 ╫	E7 τ	F7 ≈
7	23	39	55	71	87	103	119	135	151	167	183	199	215	231	247
08	18	28 (	38 8	48 H	58 X	68 h	78 x	88 ê	98 ÿ	A8 ¿	B8 ╕	C8 ╚	D8 ╪	E8 φ	F8 °
8	24	40	56	72	88	104	120	136	152	168	184	200	216	232	248
09	19	29)	39 9	49 I	59 Y	69 i	79 y	89 ë	99 Ö	A9 ⌐	B9 ╣	C9 ╔	D9 ┘	E9 Θ	F9 •
9	25	41	57	73	89	105	121	137	153	169	185	201	217	233	249
0A	1A	2A *	3A :	4A J	5A Z	6A j	7A z	8A è	9A Ü	AA ¬	BA ║	CA ╩	DA ┌	EA Ω	FA ·
10	26	42	58	74	90	106	122	138	154	170	186	202	218	234	250
0B	1B	2B +	3B ;	4B K	5B [	6B k	7B {	8B ï	9B ¢	AB ½	BB ╗	CB ╦	DB █	EB δ	FB √
11	27	43	59	75	91	107	123	139	155	171	187	203	219	235	251
0C	1C	2C ,	3C <	4C L	5C \	6C l	7C |	8C î	9C £	AC ¼	BC ╝	CC ╠	DC ▄	EC ∞	FC ⁿ
12	28	44	60	76	92	108	124	140	156	172	188	204	220	236	252
0D	1D	2D -	3D =	4D M	5D]	6D m	7D }	8D ì	9D ¥	AD ¡	BD ╜	CD ═	DD ▌	ED ∅	FD ²
13	29	45	61	77	93	109	125	141	157	173	189	205	221	237	253
0E	1E	2E .	3E >	4E N	5E ^	6E n	7E ~	8E Ä	9E Pt	AE «	BE ╛	CE ╬	DE ▐	EE ε	FE ■
14	30	46	62	78	94	110	126	142	158	174	190	206	222	238	254
0F	1F	2F /	3F ?	4F O	5F _	6F o	7F DEL △	8F Å	9F ƒ	AF »	BF ╗	CF ╧	DF ▀	EF ∩	FF BLANK
15	31	47	63	79	95	111	127	143	159	175	191	207	223	239	255

CRT Character Set Code Page 437

Code Page 850 Character Set

These are the characters for the Code Page 850 character set.

0	16	! 32	0 48	@ 64	P 80	` 96	p 112	Ç 128	É 144	á 160	Á 176	ã 192	ð 208	Ó 224	– 240
1	17	" 33	1 49	A 65	Q 81	a 97	q 113	ü 129	æ 145	í 161	Â 177	Ã 193	Ð 209	ß 225	± 241
2	18	# 34	2 50	B 66	R 82	b 98	r 114	é 130	Æ 146	ó 162	À 178	⊤ 194	Ê 210	Ô 226	— 242
3	19	$ 35	3 51	C 67	S 83	c 99	s 115	â 131	ô 147	ú 163	© 179	├ 195	Ë 211	Ò 227	¾ 243
4	20	% 36	4 52	D 68	T 84	d 100	t 116	ä 132	ö 148	ñ 164	┤ 180	─ 196	È 212	õ 228	¶ 244
5	21	& 37	5 53	E 69	U 85	e 101	u 117	à 133	ò 149	Ñ 165	181	+ 197	1 213	Õ 229	§ 245
6	22	' 38	6 54	F 70	V 86	f 103	v 118	å 134	û 150	ª 166	182	198	Í 214	µ 230	÷ 246
7	23	(39	7 55	G 71	W 87	g 103	w 119	ç 135	ù 151	º 167	183	199	Î 215	þ 231	‚ 247
8	24	) 40	8 56	H 72	X 88	h 104	x 120	ê 136	ÿ 152	¿ 168	¢ 184	╚ 200	Ï 216	Þ 232	° 248
9	25	* 41	9 57	I 73	Y 89	i 105	y 121	ë 137	Ö 153	® 169	¥ 185	¤ 201	┘ 217	Ú 233	¨ 249
10	26	+ 42	: 58	J 74	Z 90	j 106	z 122	è 138	Ü 154	¬ 170	║ 186	╩ 202	┌ 218	Û 234	· 250
11	27	, 43	; 59	K 75	[91	k 107	{ 123	ï 139	ø 155	½ 171	┐ 187	╦ 203	█ 219	Ù 235	¹ 251
12	28	- 44	< 60	L 76	\ 92	l 108		124	î 140	£ 156	¼ 172	┘ 188	╠ 204	▄ 220	ý 236	³ 252
13	29	. 45	= 61	M 77	] 93	m 109	} 125	ì 141	Ø 157	¡ 173	189	= 205	¦ 221	Ý 237	² 253
14	30	/ 46	> 62	N 78	^ 94	n 110	~ 126	Ä 142	× 158	« 174	190	╬ 206	Ì 222	¯ 238	■ 254
15	31	? 47	O 63	O 79	_ 95	o 111	△ 127	Å 143	ƒ 159	» 175	┐ 191	207	▀ 223	´ 239	255

CRT Character Set Code Page 850

Index

—D—

Troubleshooting. *See* Problems
Turning on the printer, 11

—V—

Voltage
    low or high, 32

—T—

Tallies. *See* Level 3 diagnostics
Technical specifications
    parallel interface, 40
    RS-232C interface, 36
Testing the printer, 15
Thermal paper
    ordering, 3
    requirements, 3
    suppliers, 3
Thermal printhead. *See* Printhead
Timing, 34

—W—

Wall-mount kit
    power supply, 5, 19
    printer, 4, 5, 17
Weight, of printer, 82

—X—

XON/XOFF protocol, 35